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EDITORIAL

Editorial

Oliver Friggieri (1947-2020)

Victor Grech

Oliver Friggieri (1947-2020) was a Maltese poet, novelist, literary critic, and philosopher. He led the establishment of literary history and criticism in Maltese while teaching at the University of Malta, including the works of Dun Karm and Rużar Briffa and others. A prolific writer himself, Professor Friggieri explored new genres to promote the Maltese language, including writing the libretti for the first oratorio and the first cantata in Maltese. He strongly promoted the Maltese cultural identity, while not shying from criticism. One of his most famous novels, *Fil-Parlament Ma Jikbrux Fjuri* (*No Flowers Grow in Parliament*, 1986), condemned societal tribal divisions caused by politics.

I first met Oliver in 2019 and discovered that this humble giant was also a philanthropist. Lea Hogg, a mutual friend, introduced us and pointed out that Oliver sketches. Oliver was not only happy to meet me but wsa delighted to support me in my non-profit work. He donated 48 original sketches which became the basis of a book, *Oliver Friggieri, Sketches and Poems, with responses by Victor Grech, Lea Hogg, Arthur Lyon Dahl and Richard England.* The sketches were categorized into nine themes, and we decided to match them with his poems, and some art of my own consisting of oil paintings and some digital artwork together with an artwork or sketch by Richard England and Arthur Lyons Dahl's recommendations to improve our environment in Malta, along with interviews by Lea.

The book was published in 2019, his last. I only knew Oliver for a brief time but I miss him, as do we all. *Non omnis moriar.*

Il-ħajja mistoqsija
miġbura f'elf għaliex,
u ssirlek poeżija
jekk int ma tweġibhiex.
"Jekk", Oliver Friggieri

Cover Picture:

'Pastoral'

pencil and ink sketch on cardboard

By Oliver Friggieri (1947 –2020)

Maltese poet, novelist, literary critic, and philosopher.

Victor Grech PhD (London), PhD (Malta), FRCPCH, FRCP(UK), DCH
Department of Paediatrics
Mater Dei Hospital
Msida
victor.e.grech@gov.mt

Figure 1 Book cover (*Sketches and Poems)*

Oliver Friggieri

EDITED BY VICTOR GRECH

Sketches & Poems

Featuring responses by
Victor Grech
Lea Hogg
Arthur Lyon Dahl
Richard England

Save and Support Trust
2019

Figure 2 In Professor Oliver Friggieri's personal home library. Left to right: Lea Hogg, Victor Grech and Oliver Friggieri.

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ORIGINAL ARTICLE

Is an adequate travel history being documented in recent traveling adult patients presenting with fever to the Emergency Department at Mater Dei Hospital?

Luana Formosa, Mary Rose Cassar

In recent times, with the increasing ease and needs for travelling, one can say that the world has become a global village where millions travel from one side of the globe to another within a relatively short time. In Malta, due to the recent socio-economic growth and needs, travelling has increased exponentially. Inevitably this resulted in people becoming more exposed to endemic communicable diseases and thus consequently presenting to the local Emergency Department (ED) for management. Amongst the vast clinical signs of infectious disease, fever is the most prevalent. Its presence, accompanied by a thorough travel history, should alert the Emergency Physician to follow specific diagnostic, infection control and public health pathways.

In this audit, 234 case notes of travellers presenting with fever to the ED were analysed for a travel history. The scope was to ascertain how informative these histories were. Results obtained showed that in the absolute majority of cases there was incomplete or non-pertinent travel documentation.

This audit provides a good insight into this potentially dangerous habit which needs to be curtailed. The authors propose a checklist proforma to be filled for every patient presenting to the ED with a fever after being abroad a month before the onset of symptoms.

Luana Formosa*
Higher Specialist Trainee
Emergency Department
Mater Dei Hospital
Msida, Malta
luanacaruana@gmail.com

Mary Rose Cassar
Consultant
Emergency Department
Mater Dei Hospital
Msida, Malta

*Corresponding author

INTRODUCTION

Travelling to and from Malta, including to destinations with tropical and subtropical climates, has increased in recent years. According to the Maltese National Statistics Office, nearly 2.8 million travellers visited Malta between January and December 2019,[1] while 706,797 Maltese citizens travelled to foreign destinations during the same period.[2]

Throughout the years, the World Health Organisation (WHO) and the Centre for Disease Control and Prevention (CDC) have issued various alerts on outbreaks worldwide and pandemics. To name a few, there were the:

- 1918 H1N1 pandemic which caused the death of around 50 million people worldwide
- 1957 – 1958 H2N2 pandemic which caused the death of around 1.1 million people
- 1968 H3N2 pandemic with an approximate 1 million loss of life
- 2009 H1N1 pandemic when an estimate of 151,700 to575,400 people passed away worldwide

Recently, at the time of submission but before this audit was conducted, there is an ongoing COVID-19 pandemic which was declared in the first quarter of 2020.

In recent years the CDC also issued several travel notices to international travellers.[3] To highlight the increasing frequency of such alerts, it is sufficient to note that there were ten such alerts issued between September and October 2019:

- 30th October 2019 – Dengue in Asia and Pacific Islands
- 29th October 2019 – Ebola in the Democratic Republic of the Congo
- 9th October 2019 – Dengue in the Mediterranean Region
- 8th October 2019 – Chikungunya in Ethiopia
- 8th October 2019 – Polio in the Philippines
- 7th October 2019 – Yellow Fever in Nigeria
- 3rd October 2019 – Dengue in the Americas
- 30th September - XDR Typhoid fever in Pakistan
- 13th September 2019 – Dengue in Africa and the Middle East
- 12th September 2019 – Hurricane Dorian in the Bahamas

In Malta, a considerable number of alert notifications have been issued over the years by the Directorate of Health Promotion and Disease Prevention, namely Ebola virus (2014 and 2015), Middle East Respiratory Syndrome (2015), Zika (2016), Chikungunya (2017) and COVID-19 (2020).

This audit aims to highlight the importance of taking a thorough travel history from patients presenting to the Emergency Department (ED) with fever, keeping in mind the frequency of outbreaks, epidemics and pandemics in correlation to the ease of worldwide travelling.

A clear example of the potential of how quick a simple outbreak can evolve in a full-blown pandemic with the ease of modern travelling is the current COVID-19 pandemic. In December 2019, the WHO was notified of several cases of pneumonia in Wuhan City, Hubei Province of China of which the causative microorganism did not correlate to any previously known viruses. On the 7th January 2020, the Chinese authorities confirmed that the virus was a novel coronavirus. On the 11th March 2020 the WHO director-general declared '118,000 cases

in 114 countries, and 4291 people have lost their lives' and therefore 'COVID-19 can be characterised as a pandemic'.[4] This means that within three months of an outbreak in a region in the far east, the whole world became infected.

Emergency Departments receive patients with fever every day. Although the majority of cases are not related to travel, the authors through their experience in this field of work, perceived that an accurate and thorough travel history was not always forthcoming in febrile travellers presenting to the ED. A detailed travel history is essential as highly infectious diseases will require heightened infection control measures such as personal protection equipment (PPE), specialised rooms to assess, manage and nurse these patients in the Emergency Department and admission to specialised infectious disease wards. Moreover, even if not easily transmissible, certain infections require special diagnostic tests which may not be routinely requested unless their possibility is inquired and they may be therefore missed or misdiagnosed.

This audit aimed to study whether Emergency Physicians were obtaining and documenting an adequate travel history for patients with documented fever for all the above-mentioned reasons. It was also the scope of the authors, that if a deficit in travel history taking was proven, to propose the need for a travel history checklist proforma to be attached to the emergency notes when encountering patients who present with fever shortly after returning from abroad.

Materials and Method

This is a retrospective analysis of foreign, non-resident patients who had arrived from abroad in the previous 21 days and who presented to the Emergency Department with a fever between the period of December 2017 and June 2018. Fever was defined as a temperature of 37.5° C or higher.

Such cohort was chosen as it was easier for the hospital IT database to filter out these patients as they are all given a temporary identification number ending with the letter F. Patients with Maltese citizenship have an alternative identification number and there was no reliable way on how their travelling possibility could be ruled in. Thus, it could be reliably assumed that patients with identification numbers ending with the letter F had to have travelled to Malta at some point.

The 21-day period was chosen as the recent time travel definition since this would include the incubation period of most known and common infectious agents.

Patients under the age of 16 were excluded as this cohort of patients are seen at the paediatric ED which is manned by the paediatricians. Since our authors work in the main ED patients had to be 16 years and above. Table 1 summarises the inclusion and exclusion criteria for the study.

Table 1 Summary of the study's inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
• Patients over the age of 16 years. • Patients presenting to the Emergency Department with a fever of 37.5°C or more. • Patients presenting with the above criteria to Mater Dei Hospital ED between December 2017 and June 2018. • Patients identified with an 'F' number Emergency Department number (please refer to text).	• Patients under the age of 16 years. • Patients presenting outside the study period. • Patients who were not identified with an 'F' number Emergency Department number (please refer to text).

Following the retrieval of these identification numbers, a Microsoft Excel sheet was created to document the information gathered from each case notes. Keeping in mind what the authors would have wished to see in the case notes of travellers presenting to the ED with fever, the following data was sought for:

- The patient's demographics: age, gender, nationality
- The degree of fever; its onset and any diurnal variation
- The history of travel in the previous 21 days including airports and stop-overs
- Known infectious risk behaviour while abroad like recreational drug misuse, unprotected casual sexual encounters, blood transfusions or surgical interventions, history of animal/insect bites and possible exposure to contaminated food and water
- Vaccination History
- Symptoms according to the specific organ systems.

A six-month study period was chosen from December 2017 to June 2018.

Permissions to collect this data were duly obtained from the Data Protection Officer and the Chairperson of the Emergency Department at Mater Dei Hospital. Ethical approval was also obtained through the

University of Malta Research and Ethics Committee according to the declaration of Helsinki.

RESULTS

A total of 234 case notes, of patients who fell within the audit s' inclusion criteria, were analysed.

In Figure 1 one can appreciate the vast range in age presentation of this cohort of patient. The mean age was of 34.2 years with the oldest age at presentation being that of 90 years. This was a British national and presented to the Emergency Department with fever and confusion.

Table 2 shows the native continent of origin of eligible patients who travelled to Malta and presented with fever during the study period. Although most patients were of European nationality, this did not depict the true picture as from where they travelled before arriving in Malta. This can be said of course for all the other patients. Indeed, only 9 out of 234 patients (3.8%) were inquired about the country they visited during the last 21 days prior to presentation with fever. These results expose the first fault in the system of travel history taking, where the hospital's database is not catching any previous travel before ED registration.

Figure 1 Shows the range age distribution of the patients who presented to the ED with fever post travel. As for gender, 91 were females while 143 were males.

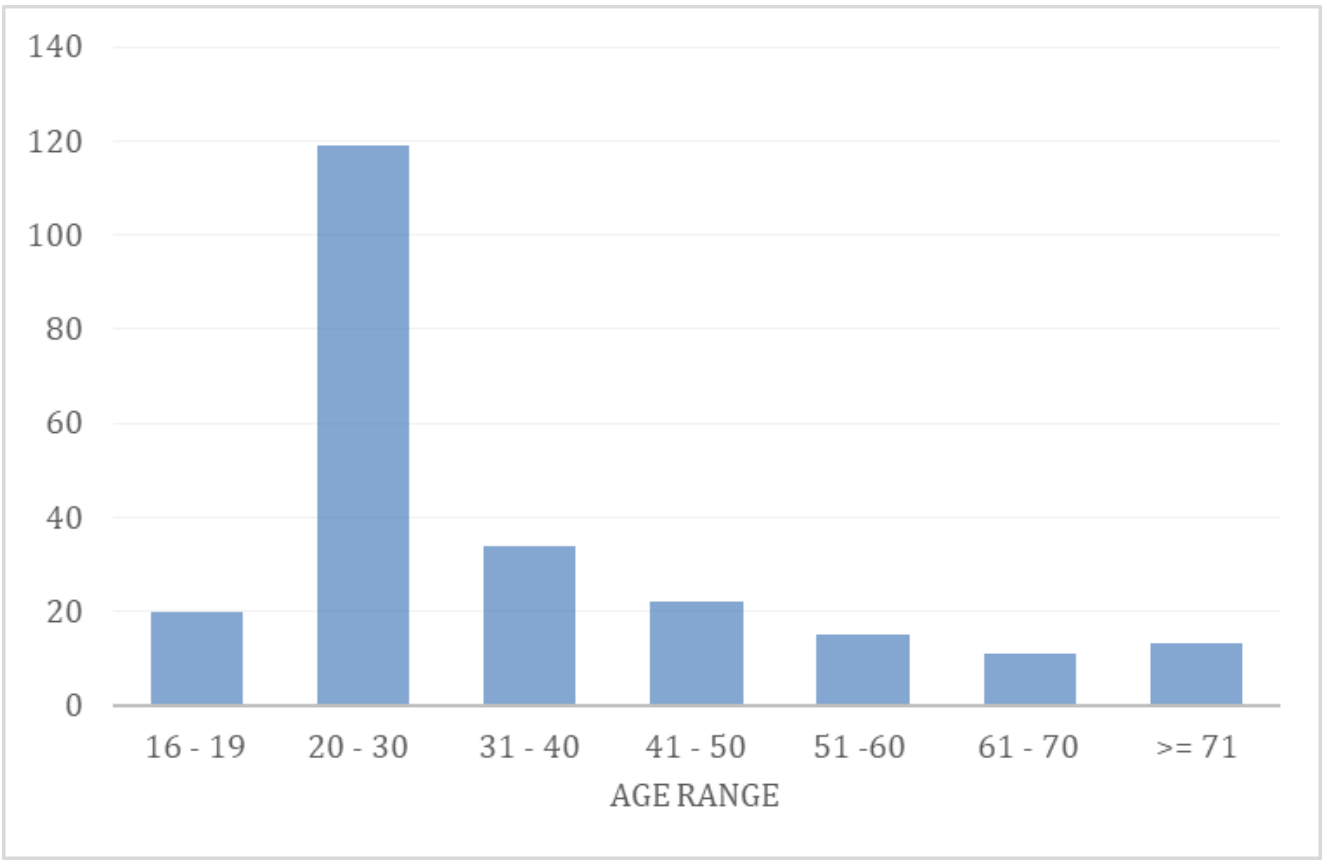

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Table 2 Native continent of origin of eligible patients who travelled to Malta and presented with fever during the study period.

Continent	Number of patients	Percentage of patients
Australia	3	1.2%
North America	4	1.7%
South America	4	1.7%
Africa	18	7.7%
Europe	156	67%
Asia	20	8.4%
Unknown nationality	29	12.3%

On inquiring about the nature and the character of the fever, while 201 out 234 patients (85.9%) were asked about the duration of fever in days, only 3 out of 234 patients (1.3%) were asked about any diurnal variation.

With regards to the documentation of symptomatology, Table 3 shows the documented numbers of specific systemic enquiries. Five main categories pertinent to common infectious disease manifestations were chosen. Gastrointestinal symptoms (48%) were the most asked followed by respiratory symptoms (36%).

Table 4 shows the paucity, almost nil, documentation of risk events or behaviours related to fever of unknown origin. Documentation of relevant travel immunisations and/or prophylactic medications was found in only 2 out of 234 patients (0.9%).

Table 3 Documentation of the number of recent travelling patients presenting with fever to the ED who had specific systemic enquiry documented.

Systemic Enquiry	Number of patients with documentation of the specific systemic enquiry findings, out of 234 patients.	Percentage of patients with documentation of the specific systemic enquiry findings, out of 234 patients.
Respiratory Symptoms	85	36%
Gastrointestinal Symptoms	112	48%
Urological symptoms	48	21%
Skin manifestations	22	9%
Others including neurological	99	42%

Table 4 Documentation of known risky events or behaviours related to fever in travellers.

Known Risks for infections	Number of patients with documentation of these specific risks, out of 234 patients.	Percentage of patients with documentation of these specific risks, out of 234 patients.
Unprotected/Casual sex	1	0.4%
Exposure to contaminated food and water	4	1.7%
Any intravenous drug abuse, need for operations and / or need for blood transfusion	1	0.4%
Exposure to animal and / or insect bites.	2	0.9%

Discussion

Up to the period of this audit, there were many biological threats throughout the years and at the time of publication, there was the ongoing novel COVID-19 pandemic which created global havoc and total revisions of most healthcare systems.

The importance of an adequate travel history, when managing patients presenting with fever, is taught in medical schools and its importance is highlighted in many acute medicine modules, yet this audit has shown that doctors do not give it its due importance. One may argue that many relevant questions might have been asked in real life but they were not documented. However, as the adage goes, if it was not written down, it never happened.

Infectious diseases are usually spread via the respiratory, oral, dermal or sexual routes. Their initial presentations are usually quite ambiguous and vague like fever, lethargy, malaise and various systemic presentations.

Travelling per se might increase the risk of communicable, endemic diseases which might affect personal health and wellbeing. Such risks should be sought for prior to travelling, especially if it entails visiting unfamiliar or remote areas.[5] The risk of becoming infected will depend on the purpose of the trip, the accommodation sought and the behaviour adopted by the traveller.[6] Certain countries are known to be endemic to diseases such as Ebola, Dengue, Lyme Disease, Malaria, Chikungunya and much more and thus travellers should educate themselves on what precautions need to be taken to reduce the risk for exposure. The need for vaccination should be checked prior to travel.[6]

In more recent and actual times, the pandemic spread of the COVID-19 disease was directly related to travelling from areas with outbreaks. Indeed, the CDC issued articles advising that one can contract COVID-19 during travelling. Whole articles issue information on what needs to be done before, whilst and after travelling to minimise the risk of exposure.[7]

Travel history indeed became the first filter question to identify the at-risk patients presenting to the ED. Unfortunately, this happened only due to a heightened known global threat. Example admitting an active tuberculosis as a routine chest infection in a normal hospital ward, due to a lack of a proper travel history, may be dangerous not to mention its discharge into the community without adequate treatment and containment.

The results obtained in this audit show that there is a significant lack of documentation and even unawareness of the potential harm caused by travel-related communicable diseases. A travel history is in reality not very laborious but one may argue that in a fast-moving, time and resource-constrained ED, this is an extra and a thorough, time-consuming history is time-wasting. The authors disagree with such argument and argue that in an era where the world has become a 'global village', due to heavy population movements secondary to trade, work and leisure, it is important to exercise constant surveillance to contain the communicable disease as much as possible. Our audit has shown that doctors are not giving a travel history its due importance unless there is a compulsory, high alert imposed by the international or local infection control specialists. There is even lack of some basic history like sexual history. In our study only one patient had a sexual history for unprotected sex recorded and this is a basic question that one asks during medical history taking for fever of unknown origin.

Although the researchers did not investigate the reasons for such lack of documentation, we could assume that these include work pressure, language barriers, decreased awareness of the importance of travel history and absence of a designated space for travel history on the Emergency Department clerking sheet. In our study only one patient had a sexual history for unprotected sex recorded and this is a basic question that one asks during medical history taking. The authors believe that this is not good practice.

The researchers are therefore proposing the use of a ready-made checklist which should be used at all times for all patients who present to the ED with fever and recent travel history. Figure 2 shows the proposed checklist which is essentially a one-page document, which can be added on to the current ED clerking sheet, and mainly incorporates the essential and important information that needs to be documented. If this proforma is uploaded on an electronic platform together with the electronic ED documentation, it can be further made easier by offering the options for drop-down choices.

This proforma should be filled for all those patients presenting with fever and who admit to travelling to and from abroad in the previous one month. This is because such proforma includes basic symptomatology, high-risk presentations and contact information which will aid the diagnostic, infection control and contact tracing/ public health pathways. It also doubles up as an easy aide-memoire for the less experienced doctor.

The authors acknowledge the limitations of this study which are mainly the:

- Exclusion of travellers who are local residents and who were excluded for ease of data retrieval as mentioned in the methodology section. This would have been a very important control group to cross-reference with.
- Exclusion of paediatric (under the age of 16 years) patients
- Data collection relied only on the documentation in the emergency history notes

Figure 2 Proposed Checklist Proforma for patients presenting to the ED with fever and with a history of travelling in the last one year.

Patient's name:_____ **Age:**_____ **Hospital Number:** _____

Patient's Telephone Number: _____ **Patient's Next of Kin Telephone Number:** _____

Temperature: _____℃ (oral, rectal, skin)
(delete as necessary)

Any diurnal variation of fever? Yes / No
(specify as necessary:_____)

General Systemic Enquiry: malaise, fatigue, anorexia, skin rash, bruises, yellowish skin discoloration, diaphoresis,

Respiratory Systemic Enquiry: cough, sore throat, sneezing, dyspnoea on exertion, dyspnoea at rest, nocturnal dyspnoea, sputum production & colour_____, haemoptysis, pleurisy, wheezing,

other _____ ***(delete as necessary)***

Cardiovascular Systemic Enquiry: chest pain, dyspnoea on exertion, dyspnoea at rest, nocturnal dyspnoea, lower limbs swellings, other _____ ***(delete as necessary)***

Gastro-intestinal Systemic Enquiry: nausea, vomiting , diarrhoea & colour_____& daily frequency_____, haematemesis (fresh blood), coffee ground vomiting, abdominal pain, malaena, fresh bleeding pr, other_____ ***(delete as necessary)***

Genito-urinary Systemic Enquiry: dysuria, ↑urine frequency, nocturia, foul smelling urine, discoloured urine & colour_____, haematuria, bleeding or discharge pv, penile bleeding or discharge, other

Neurological Systemic Enquiry: headache, meningism, sensory disturbance, motor disturbance, gait problems, visual problems, auditory problems, anosmia, tremors, other _____***(delete as necessary)***

Musculoskeletal Systemic Enquiry: myalgias, arthragias, joint swellings, joint stiffness, other_____

_____ ***(delete as necessary)***

Predisposing factors for fever in travellers : ***(specify & delete as necessary)***

Travel History: Place/s travelled to in the last one year, including dates and length of stay:_____

_____

_

High Risk Events: Contact with known infectious persons, unprotected/ casual sex , IVDU, surgery or invasive procedures in the last one year, animal/ insect bites, contact with sewage or highly contaminated environments, ingestion of possible contaminated food/ drink, other_____

Immunizations / Prophylactic travel treatments:

Another important limitation is that the 21 days post-arrival time limit might be too short to include all possible communicable diseases.

However, going through 234 case notes of travellers presenting to the ED with fever, did shed light on the need for doctors to acknowledge more the importance of a proper travel history when managing fever in travellers and to document it properly.

This study was performed and concluded before the onset of the COVID-19 pandemic. The authors acknowledge that this event has changed the whole modus operandi of EDs around the globe and the early, thorough travel history of febrile patients has become crucial. Indeed, the authors recommend for a re-audit to be carried out during the pandemic times and to investigate whether this event changed the doctors' proper travel history records.

Conclusion

This audit has shown that although Emergency Physicians are aware that the population visiting the Emergency Department is a varied one, documentation still leaves much to be desired. Proposal of a ready-made proforma is made and this should be used at all times for patients who present to the Emergency Department with fever and a recent history of travel.

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ORIGINAL ARTICLE

Quality of Care in a Paediatric Emergency Department

Rebecca Borg, John Borg Cremona, Thea Dimech, Annelise Aquilina, Marie Claire Grech, Francesca Curmi, Sophie Degiorgio, Eugenio Azzopardi

Background

Measuring quality of care in a paediatric emergency department is challenging and there is lack of specific set measures to do so. The primary objective of this study was to determine the quality of care in our local paediatric emergency department by applying a set of quality indicators. The secondary objectives were to determine lacunae in quality of care and thus make suggestions for improvement.

Methods

A retrospective study was carried out using data collected from records of children presenting to the paediatric emergency department with a medical complaint between August and December 2019, during the first two weeks of each month. The Institute of Medicine Quality Domains were used to assess the quality indicators measured.

Results

Specific quality indicators require improvement including weight documentation, time to triage, and safety netting practices. A lack of quality indicators measuring patient-centeredness, staff experience, and equity was noted.

Conclusion

Suggestions, both for improving quality of care and its measurement, are made, in light of the new challenges faced by paediatric emergency departments.

Rebecca Borg* MD MRCPCH
Department of Child & Adolescent Health
Mater Dei Hospital, Msida, Malta
rebecca.c.borg@gov.mt

John Borg Cremona MD MRCPCH
Department of Child & Adolescent Health
Mater Dei Hospital, Msida, Malta

Thea Dimech MD MRCPCH MSc
Department of Child & Adolescent Health
Mater Dei Hospital, Msida, Malta

Annelise Aquilina MD MRCPCH
Department of Child & Adolescent Health
Mater Dei Hospital, Msida, Malta

Marie Claire Grech MD MRCPCH
Department of Child & Adolescent Health
Mater Dei Hospital, Msida, Malta

Francesca Curmi MD
Department of Child & Adolescent Health
Mater Dei Hospital, Msida, Malta

Sophie Degiorgio MD
Department of Child & Adolescent Health
Mater Dei Hospital, Msida, Malta

Eugenio Azzopardi MD DCH MSc MSc
Department of Child & Adolescent Health
Mater Dei Hospital, Msida, Malta

*Corresponding author

Introduction

A significant number of paediatric patients attend the emergency department (ED), and thus concerns about the access to and the quality of care provided are widespread. There are specific challenges when it comes to measuring quality of paediatric emergency care, related to the unique setting, children's dependency on others, their greater vulnerability, needs that vary according to age and development, different epidemiology, small numbers of patients with specific conditions, and lack of evidence due to limited studies available on urgent or emergent conditions in children.[1-2] Most measures have been developed for adult care and then extrapolated into paediatric practice,[2] and there is lack of measures which are specific for acute paediatric care.[3]

The aim of this study was to determine the quality of care in our Paediatric Emergency Department (PED) at Mater Dei Hospital, the only ED providing such a service to a population of around 0.5 million. It is a relatively young PED, having opened in 2015, seeing increasing number of patients (around 22,000 patients per year) and the development of new services. Thus, the question arises whether there is a gap between the expectations and realities of the quality of care delivered.

Paediatric quality measures are "reference point(s) against which data on child health care service provision can be assessed and quantified against clear criteria in terms of its quality domains".[2] A quality measure technically differs from a quality indicator in that the former incorporates the methods required to determine the performance of a quality indicator, and thus should have gone through testing to determine factors such as reliability, validity, and feasibility.[4] Since the exact definitions vary according to different countries,[2] for the scope of this study, the terms 'quality indicator', 'quality measure', or 'performance measure' are used interchangeably.

The primary objective was therefore to determine whether such quality indicators applied to the local setting are being reached. The secondary objectives were to determine the lacunae in our quality of care and thus make suggestions on how to improve measurement of quality of care and how to improve on these quality indicators.

Materials and Methods

Data was collected retrospectively from medical notes used in the PED supplemented by data collected from electronic record systems. Children under 16 years of age presenting with a medical complaint to the PED between August and December 2019, during the first two weeks of each month were studied. Surgical, ENT, Ophthalmic, and Psychiatric cases were excluded from the cohort. Ethics approval was obtained from the Faculty Research Ethics Committee of the University of Malta.

A literature review was carried out to define the quality indicators traditionally used to assess paediatric emergency care, followed by a discussion with the PED clinical lead about standards for emergency care that are followed locally to determine which quality indicators could be applied to the local setting (Table 1). Each quality indicator studied was also linked to a quality domain according to the Institute of Medicine (IOM).[5]

Table 1 Quality indicator goals, IOM quality domains, and study results

Quality Indicator	Goal	IOM Quality Domain	Our Result	Reference
Weight documentation	In 100% of cases	Safety Effectiveness	65.76% documented	Alessandrini et al, 2011[6]
Time to Triage	15 minutes	Timeliness Efficiency	46.40% within target Mean 19.94 minutes (95% CI 19.30, 20.59)	RCPCH Facing the Future, June 2018[7]
Time to FMC	Median time < 60 minutes	Timeliness Efficiency	Median time 45 minutes	CEM, 2011[8]
FTA rate	≤5%	Safety Patient-centeredness Timeliness	1.85%	CEM, 2011[8]
Lab turnaround time (intra-laboratory)*	60 minutes	Timeliness Efficiency	61.82% within target Mean 59.17 minutes (95% CI 55.35, 62.99)	Hawkins, 2007[9]
Time to A&E Ready**	4 hours	Timeliness Efficiency	91.65% within target Mean 121.37 minutes (95% CI 117.27, 125.48)	Guidance Handbook to the NHS Constitution for England[10]
Boarding time***	-	Safety Patient-centeredness Timeliness Efficiency	Documented in 65% Mean 165.17 minutes (95% CI 152.56, 177.78, median 139 minutes)	-
Documentation of warning signs	In 100% of cases	Safety Patient-centeredness	84.69% documented	RCPCH Facing the Future, June 2018[7]
Documentation of being given written advice	In 100% of cases	Safety Patient-centeredness	35.85% documented	RCPCH Facing the Future, June 2018[7]
Rate of unscheduled re-attendance	≤5% (within 7 days)	Effectiveness	3.65% (within 3 days)	CEM, 2011[8]

*Intra-laboratory lab turnaround time = time interval from when the sample is received by the laboratory to when the result is issued to the healthcare provider; differing from the total lab turnaround time (mean 91.62 minutes, 95% CI 85.95, 97.28, median 83 minutes), which also reflects how long a sample takes to arrive to the laboratory.

**A&E ready = when final patient disposition is decided

***Boarding time = time when a patient is transferred from the PED to the ward once the patient was set to be admitted

(IOM = Institute of Medicine, FTA = failed to attend, FMC = first medical contact)

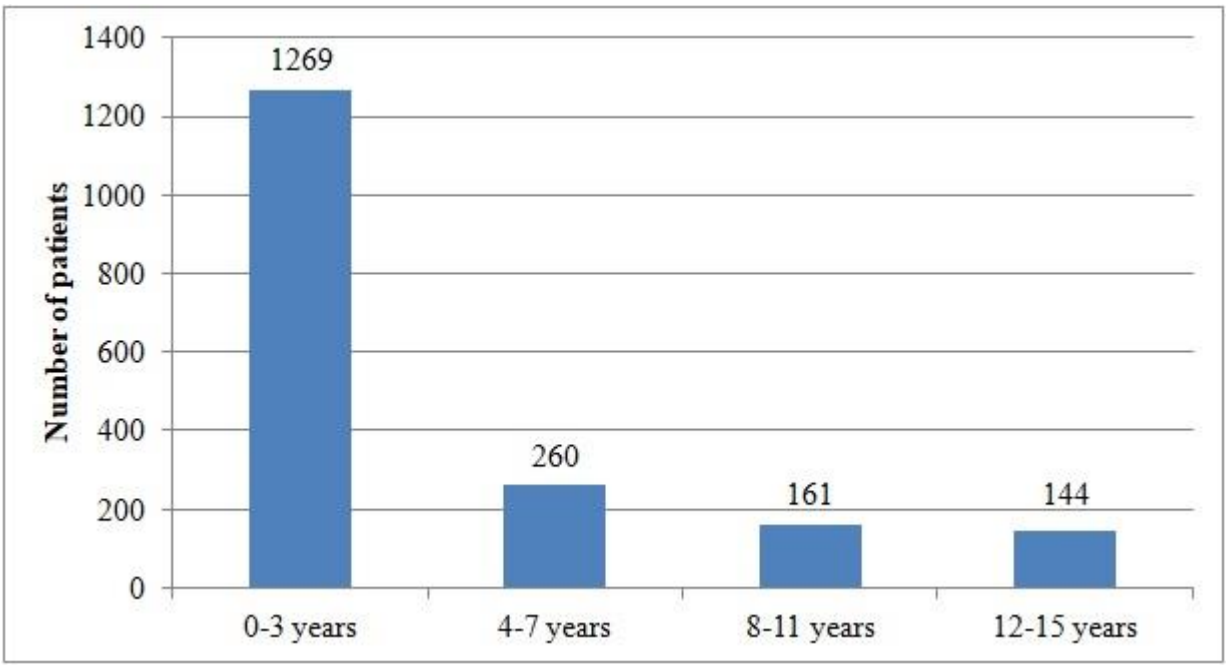
The aim was to not to come up with a comprehensive set of quality indicators, but to perform a general analysis of quality of care at our PED using routine data which is already collected at every ED visit as part of the process of care. Priority was given to indicators that measure the overall quality of the PED, rather than disease-specific measures.[4]

RESULTS

The total number of cases reviewed was 1834 with a slight male predominance (56% males). Upper respiratory tract infection was the commonest provisional diagnosis (22.36%), followed by gastroenteritis +/- dehydration (15.65%) and viral induced wheeze (7.69%). Most cases were discharged (72.46%); only 24.86% were admitted. The rest either discharged against medical advice or failed to attend when called for medical review. The majority of cases were of a higher Emergency Severity Index (ESI) triage category, that is, ESI-2 and ESI-3 (35.39% and 43.68% respectively). Children younger than 4 years attended the PED more than older age groups (69.19%), with 53.9% of these being 1-3 years old, 41.69% being infants (29-365 days), and 4.41% being neonates (0-28 days). (Figure 1)

The goals for each quality indicator were delineated from various sources describing standards of care in a PED and these were then compared to our results as shown in Table 1.

Figure 1 Age groups



Discussion

Improvement of quality of care can only be achieved if it is measured, but a lack of international standards makes performance measurement in paediatric emergency care challenging.[1-2,6,11]

There are various frameworks that can be used to aid measurement of quality of care.[12] In 2001, the IOM proposed six aims for improvement of healthcare, which are widely used in discussions on quality of care:

1. Safety;
2. Effectiveness;
3. Patient-centeredness;
4. Timeliness;
5. Efficiency;
6. Equity.[5,12]

A health care system that fulfils these aims benefits both patients and clinicians and is also beneficial in financial terms.[4-5] Furthermore, these principles can be applied in general terms as well as to disease-specific scenarios.[1] In this study, general measures were focused on using the IOM framework of quality domains.

Safety

Aiming to have safe quality care in a PED revolves around creating an environment which avoids harm to patients and staff. Documentation of weight ensures safe prescribing, and thus is a measure of safety. Weight is recommended to be documented in all cases but in this study weight was documented only in 65.76%. A possible explanation could be that not all cases required administration of medication or fluids (thus requiring weight for appropriate calculation).

Patients who leave the ED before being seen by a physician can be a safety concern and thus FTA (failed to attend) rates may also be a useful indicator of safety, albeit controversial. Long waiting times are often assumed to be the reason why a patient may leave; however, it is essential to remember that other factors may cause patients to leave prematurely.[13-14]

Boarding time, which is the time a patient spends waiting to be transferred to a ward once emergency care has been delivered and disposition has been decided, is crucial, both for continuation of treatment and for medico-legal issues. In this study, it was difficult to compute, and thus interpret, due to a lack of documentation. One possible explanation for this could be due to lack of designated documentation space on the local PED documentation sheet.

It is imperative that children and their parents/carers are provided, at discharge, with both verbal and written safety netting information, in a form that is accessible. 'Red flag' signs and symptoms should be explained and understood by parents or caregivers.[15-16] Explanation of warning signs prior to discharge was documented in the notes in 84.69% of the cases reviewed.[7] Remaining cases could be cases in which safety netting was not carried out, or carried out but not documented. A limitation to parents being given written advice could be that such advice merely does not exist in the department where this study was carried out; for example, leaflets on fever and vomiting exist, but not on bronchiolitis or asthma.

Alternative ways of safety netting could include telephone follow ups for results, telemedicine, and the use of discharge notes for written advice and for appropriate

handover to the patient's general practitioner.[5,15-16]

As improper documentation in this study could have possibly contributed to these results, a shift to electronic medical record keeping could make performance measurement more viable, less laborious, and more accurate.[1]

Effectiveness

Effective care is evidence based, with avoidance of underuse, overuse, and misuse. As mentioned earlier, weight measurement is important to ensure safety but it could also be a measure of effectiveness, as weight measurement at a PED visit should also be done to opportunistically assess growth in children.

Re-attendance to the PED might imply inadequate, and thus ineffective, care being given the first time round, lack of patient or carer satisfaction, or overuse of the service. However, it could also be due to a prolonged illness or deterioration, with parents/carers acting upon red flags explained previously.

Patient-centeredness

The physical environment of the PED should be welcoming for children, both in terms of putting them at ease and also in terms of having facilities which meet their needs and those of their carers, such as nappy changing facilities, breast feeding friendly space, and the availability of a play specialist. Such measures would help reduce fear, pain, and discomfort, ensuring a patient centred approach to improving quality of care.[5,7]

During our review of cases we noted that patients' and carers' feedback and complaints were rarely documented. Patient-reported measures, such as measures of satisfaction with care and experiences of care, provide the patient's perspective. These can indicate which areas of healthcare are of high quality and which need improving.[17] Patient feedback forms would be useful to assess the patient's and family's satisfaction of service.[17] Such suggested tools include the 'NHS Friends and Family Test' as well as the more paediatric-specific surveys available on the Royal College of Paediatrics and Child Health (RCPCH) Patient Reported Experience Measure (PREM) for urgent and emergency care website.[18]

Timeliness

Time-related indicators are prevalent since emergency care is focused on quick recognition and treatment of time-dependent critical conditions, with adequate disposition to the next level of care. Such quality indicators, including time to triage, time to first medical contact (FMC), FTA rate, lab turnaround time, time to A&E ready, and boarding time, are of vital importance because they help reduce ED overcrowding and improve patient flow.[11]

Triage practices should be enhanced by improving the triage waiting time. Additionally, if the triage waiting time exceeds 15 minutes there should be a system of prioritisation for full assessment. In the event of abnormal vital signs being recorded at triage, these parameters should be repeated within 60 minutes.[7]

Efficiency

An efficient healthcare system is one in which waste of resources, ideas, and energy is avoided. This can be challenging to measure; focus is often given to measurement of time-related indicators, but other variables should also be considered. For example, intra-departmental staff surveys could be used to assess if individuals feel that their ideas are being heard and employed. 'Staff experience' is, in fact, another measurement domain

proposed by the RCPCH.[3] In our study no indicators could be applied in these terms. Sørup et al. also noted that employee satisfaction and perspective have not been given due importance when assessing performance of emergency care.[11] This is a very important aspect in quality of care because it ensures sustainability and because staff is the biggest resource in healthcare.[3,11]

Equity

Care which is equitable should not vary because of personal characteristics, including gender, race, age, ethnicity, geographic location, disability, and socio-economic status. A limitation to this study was the lack of quality indicators in place which would ensure equitable care in the PED. This has been observed elsewhere; in a study by Alessandrini et al.,[6] only 0.5% of identified performance measures were related to equity. This fact, in and of itself, may indicate a lack of equity. It was noted that the information leaflets given to parents/carers are only available in the country's two main languages, but not all can understand or are able to read these written languages. Thus, one questions whether measures are being taken to ensure that patients from all countries and of all nationalities receive the same quality of care. The translation services in our PED are not available at all times of the day and are not readily available. The PED staff does not receive any training on how to improve our clinical interactions with different cultures. Another important aspect of equity is accessibility of the PED itself, including an environment accessible to patients with mobility issues as well as the visually and hearing impaired.

Apart from ensuring that all IOM quality domains are being addressed, the alternative ways of measuring quality of care could also be used. For example, using the Donabedian method, structure, process, and outcome could be assessed,[19] by looking into staffing numbers, the number of cubicles available for patient review, staff education and training, and use of electronic alert systems (such as for prescribing and drug allergies, and for adverse incident reporting). Disease-specific quality measures should also be explored, but these would require separate studies.

Focus on one particular indicator, with good results for one such specific measure, may not translate to good quality care as this might be at the cost of other quality measures. For example, in an attempt to transfer a patient to a ward within the four hour target, treatment may be missed or postponed.[11] A balance has to be reached between an adequate number of chosen quality indicators to allow for an extensive analysis and a manageable number to work with.[11] Furthermore the chosen quality indicators have to be shown to be valid and reliable before they can be applied to clinical practice.[6] Although applicability to the local setting is important, a joint set of quality indicators with other EDs would also be useful for benchmarking purposes.[11] Quality indicators should however be used in the context of quality improvement to promote change, rather than as a method of comparing one service to another or to show attainment of a standard.[4] Thus, various working groups may need to be set up to measure quality indicators, perform regular review (as opposed to one-off measurements), and propose interventions for improvement.

Limitations

This was a single centre study as data was collected from one hospital. Since this hospital provides the only paediatric emergency care in the country, the study was representative of national paediatric emergency care, but it may not reflect the quality of care provided in other centres. Also, the sample of population studied was taken over a period of five months, and, although it included both summer and winter months, it may not be representative of the whole year. As highlighted earlier, incomplete documentation led to the inability to assess all quality domains. This was further augmented by the retrospective nature of the study.

Conclusions

This study was carried out prior to the COVID-19 pandemic and the number of patients attending the PED then was relatively higher than more recent months. The COVID-19 pandemic has however put an additional strain on our paediatric emergency services, with the need for relocation, changing protocols, new infection control precautions, and high levels of uncertainty. With increasing number of patients now attending the PED again, an expected surge once the pandemic is over, and the need for relocation, paediatric emergency services have to be planned to ensure that our paediatric patients and their families receive the quality of care they deserve. We feel that we must guarantee that the good standards of care and the services offered in the past are maintained. This means that resources, the physical environment, and staff roles have to be re-planned to be in line with the new infection control measures.

The recommendations brought forward here, therefore, have to be taken in light of this situation. As suggested by the RCPCH, this can be a time when we can reset how healthcare for children is planned and delivered, and as the emergency crisis eases, restore paediatric services and recover healthcare professionals back into paediatrics.[20]

Summary Box

What is already known about this subject:

- There are various frameworks that can help measurement of quality of care, including the widely used six aims for improvement of healthcare by the Institute of Medicine.
- Studies have mostly focused on quality measures for adult care and then these have been extrapolated into paediatric practice.
- The unique setting and population of paediatric emergency care bring about specific challenges when measuring quality of care.
- The local paediatric emergency department is a relatively young department, still evolving and growing.

What are the new findings:

- A lack of quality indicators measuring patient-centeredness, staff experience, and equity was noted.
- Specific quality indicators requiring improvement include weight documentation, time to triage, and safety netting practices.
- Suggestions for improving quality of care and its measurement have to be done in light of the new challenges faced by paediatric emergency departments.

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ORIGINAL ARTICLE

Relationship between thyroid status and survival rates in patients presenting with acute coronary syndrome

Ruth Caruana, Sandro Vella, Maryanne Caruana, Andrew Cassar, Josanne Vassallo

Thyroid dysfunction is a relatively common and treatable disease. The aims of the study included investigating the frequency of thyroid dysfunction in patients presenting with acute coronary syndrome (ACS) in our unit, following them up for 8 years and assessing the impact of thyroid dysfunction on their long-term outcome.

Thyroid dysfunction is common among patients presenting with ACS in our unit. Forty one percent (n=36) of those included had abnormal thyroid function tests at presentation with ACS, with the most common condition being subclinical hypothyroidism. The mean age of all patients was 62.3 years and there was no significant age difference between males and females. There was no significant correlation between age and TSH and age and T4 levels.

Forty two percent (n=37: 30 euthyroid, 7 thyroid dysfunction) died by the end of the observation period. A Kaplan-Meier curve was performed to check for any differences in survival across thyroid dysfunction categories. We report shorter survival times for patients who are euthyroid at presentation with an ACS.

Ruth Caruana* MD MRCP MSc
Clinical Nutrition
Diabetes and Endocrine Unit, Mater Dei Hospital
Msida, Malta
ruthcaruana82@gmail.com

Sandro Vella MD (Melit), MSc (Roeh), MD (Dund), FRCP (Edin), FRCP (Lond)
Diabetes and Endocrine Unit, Mater Dei Hospital
Msida, Malta

Maryanne Caruana M.D.(Melit) Ph.D.(Melit) FRCP(Edin) FESC
Department of Cardiology
Dei Hospital
Msida, Malta

Andrew Cassar
Department of Cardiology
Dei Hospital
Msida, Malta

Josanne Vassallo MD PhD FRCP FACP FACE
Department of Medicine
Faculty of Medicine and Surgery
University of Malta
Msida, Malta

*Corresponding author

Introduction

Thyroid dysfunction is relatively common, readily diagnosed and treatable. Most thyroid dysfunction is subclinical and is only diagnosed with the appropriate blood test.

There are long term effects associated with thyroid dysfunction. Overt hypothyroidism and hyperthyroidism are linked to adverse cardiovascular (CV) outcomes.[1-2] Various studies have also shown that even in subclinical hypothyroidism and subclinical hyperthyroidism there is an increase in CV morbidity and mortality.[3-7]

The reason for this association is that thyroid hormone receptors are found both in the heart and vasculature. Therefore, any changes in thyroid hormone levels will affect end organ function in these areas. The relationship of thyroid hormone with the CV system is complex and the effects are modulated in several different ways. Excess thyroid hormone effects on the heart include increased heart rate, contractility and overall risk of coronary heart disease. On the other hand thyroid hormone effects on vasculature include variation in smooth muscle tone and hence blood pressure.[8-9]

Hyperthyroidism and therefore thyroid hormone excess, is associated with a hyperdynamic circulation, an increased cardiac output, subsequent development of systolic hypertension[10] and an increased risk of coronary heart disease. Hypothyroidism and hence thyroid hormone deficiency, is associated with diastolic hypertension and impaired vascular function.[11] Thyroid hormones increase endothelial production of nitric oxide and other changes which lead to changes in endothelial function due to smooth muscle relaxation.[12] Consequently, in hypothyroidism this impaired endothelial function improves with replacement of thyroid hormone.[13-14] In addition thyroid hormones have a direct effect on lipid metabolism with hyperthyroidism associated with decreased levels of cholesterol (TC)[15] and hypothyroidism with higher low density lipoprotein cholesterol (LDL-C) levels.[16] Once thyroid hormone levels normalized, lipid profiles return to normal in both hyper- and hypothyroidism. Thyroid hormones also modulate inflammatory and coagulation pathways. An overall increased hypercoagulability has been documented in hyperthyroidism,[17] while conflicting results have been reported in hypothyroidism.[18]

Overt and subclinical hyperthyroidism

Hyperthyroidism and thyroid hormone excess cause increased cardiac output by increasing stroke volume and heart rate.[19] However despite a high output state, hyperthyroid patients have reduced cardiopulmonary function during exercise due to decreased CV reserve[20]. Overt hyperthyroidism is associated with increased CV morbidity and mortality mainly due to an increased incidence of heart failure.[21-22] Untreated hyperthyroidism may cause high output heart failure even in those with a previously healthy heart. [22]

Furthermore, hyperthyroidism is associated with increased risk of atrial ectopics and atrial fibrillation. The onset of atrial fibrillation is associated with increased CV morbidity and mortality.[23] Subclinical hyperthyroidism was also shown to be associated with the development of atrial fibrillation.[7] On the other hand, studies regarding the association of CV morbidity and mortality with subclinical hyperthyroidism provide conflicting data due to major differences in study design, methods and cut-offs used. Despite this, treatment of subclinical hyperthyroidism is advocated internationally especially if the patient has

other CV risk factors and a Thyroid Stimulating Hormone (TSH) suppressed to less than 0.1mIU/L. In particular the European Thyroid Association guidelines recommend treatment in those with CV risk factors and a TSH <0.1mIU/L at any age. It is also suggested that if the patient is over 65 years and has underlying CV disease or history of fractures, treatment should be considered even if TSH is only mildly suppressed (0.1-0.39 mIU/L) in an attempt to decrease risk.[24]

A well-known long term effect of both subclinical and clinical hyperthyroidism is increased bone turnover causing osteoporosis and increased risk of fractures.[1,25] As described above, treatment is recommended to improve outcomes.

Overt and subclinical hypothyroidism

Overt hypothyroidism is associated with a reduction in cardiac output, decreased heart rate and increase in peripheral vascular resistance and diastolic dysfunction.[26] There is an association of hypercholesterolemia, diastolic hypertension and reduced endothelial nitric oxide with overt hypothyroidism. Normalization of thyroid hormone levels causes reversal of these features.[27]

Subclinical hypothyroidism is known to be associated with diastolic dysfunction due to impaired ventricular relaxation.[28] Subclinical hypothyroidism was shown to be linked to an increased risk of congestive heart failure among adults with a TSH level of 7.0 mIU/L or greater.[29] The Whickam Survey cohort showed that subclinical hypothyroidism is associated with dyslipidaemia namely higher TC levels, LDL-C levels, and triglycerides (TG).[5,30] Higher TSH levels were associated with higher systolic and diastolic blood pressure.[5,31-32]

Various studies have been published showing an association between CV outcomes and subclinical hypothyroidism. The EPIC- Norfolk study found a worse cardiovascular risk factor profile.[33] However, this increased CV risk was not confirmed in all studies. Specifically subclinical hypothyroidism was not associated with increased risk for coronary heart disease,[34-35] stroke,[36] peripheral arterial disease,[29] or CV-related or total mortality.[29]

Current data on mortality is not conclusive. Subclinical hypothyroidism was shown to be associated with an increased risk of coronary heart disease and mortality in those with higher TSH levels,[29] especially in those with a TSH concentration of 10 mIU/L or greater.[34] Subclinical hypothyroidism was also shown to be linked with an increased risk for all-cause mortality and CV death.[37] On the other hand, another study has shown that subclinical hypothyroidism might be associated with a lower risk in all cause mortality.[38] More recent studies showed no association with subclinical hypothyroidism and overall death in the elderly.[39-40] However, treatment of subclinical hypothyroidism was shown not to improve either all cause mortality,[41] or CV mortality.[42]

Aim

The aims of the study included investigating the frequency of thyroid dysfunction in patients presenting with acute coronary syndrome (ACS) to the Coronary Care Unit at St Luke's Hospital, Malta between 1st February 2002 and 30th June 2003, follow-up of these patients at St. Luke's and Mater Dei hospitals until December 2010 and assessing the impact of thyroid dysfunction on patient outcomes.

METHOD

This was a prospective, case controlled study. Patients presenting with Acute Coronary

Syndrome (ACS) at St Luke's Hospital, Malta between February 2002 and June 2003 were included in the study.

Exclusion criteria included ongoing treatment for thyroid dysfunction and ongoing treatment with beta-blockers and/or amiodarone. All patients who were admitted to CCU and did not fit in the exclusion criteria were included in this study.

Data collected included anthropometric parameters at presentation; serum and plasma samples were taken within 24 hours of presentation for thyroid function tests, renal profiles, creatinine kinase, lipid profile, random blood glucose (RBG) and glycosylated haemoglobin.

Additional data captured at presentation with ACS included diabetes subtype, current glucose lowering regime at presentation and cardiovascular risk factors, namely smoking, hypertension, dyslipidaemia, and family history.

Subsequently, follow-up data was collected until December 2010. Cardiovascular complications were recorded together with readmission rates with coronary and other events, duration of hospital stay and mortality data. Information was collected both from hospital notes and death certificates.

SPSS® 22.0 was used for data analysis. Mann-Whitney U and Kruskal-Wallis tests were used to compare differences in continuous variables between thyroid categories. Chi Square test and Kruskal-Wallis tests were used to compare frequencies across thyroid categories. Spearman's correlation was used to correlate continuous variables. Kaplan Meier survival curve was used to compare survival rates across thyroid categories. Significance was defined by a two-tailed p value of < 0.05.

Classification

The classification of thyroid status was defined in Table 1 as follows:

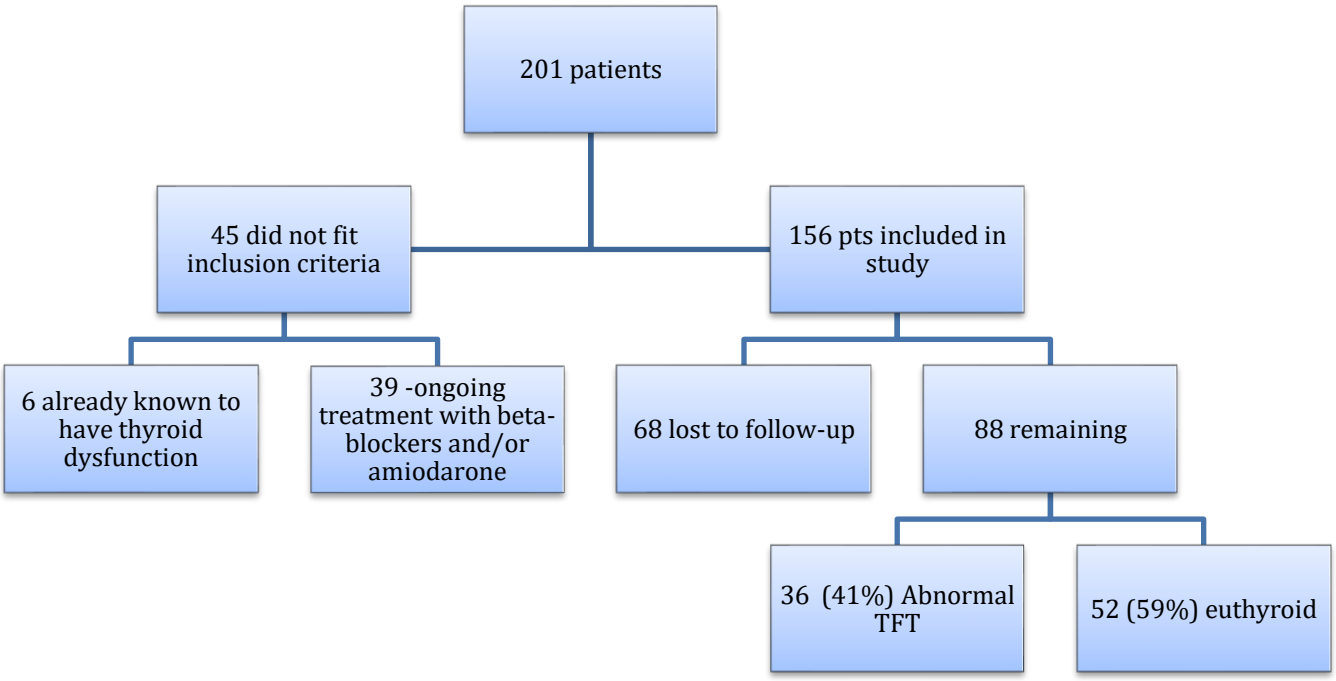
Table 1 Classification of Thyroid Status

Thyroid status	TSH and T4 concentration
Overt hypothyroidism	TSH ≥ 10 mIU/L or TSH concentration > 4.00 mIU/L with a free T4 below 10.3 pmol/l
Subclinical hypothyroidism	TSH concentration between 4 and 10 mIU/L with a normal free T4 (10.3-24.45pmol/l)
Euthyroidism	TSH concentration 0.4 to 4.0 mIU/L
Subclinical hyperthyroidism	TSH concentration > 0.1 and < 0.4 mIU/L with a normal free T4 (10.3-24.45 pmol/l)
Overt thyrotoxicosis	TSH concentration < 0.10 mU/L in the setting of a normal / elevated free T4 or a TSH value of 0.1- 0.4 in the setting of a high T4 or high T3
Sick euthyroidism	Can occur in any systemic illness and typically low FT3 and/ or FT4 with low normal/normal TSH.

RESULTS

There were a total of 201 patients admitted to the coronary care unit from February 2002 to June 2003 as shown in Figure 1. Out of these, 88 patients admitted with ACS fitted the inclusion criteria. Another 6 were admitted with ACS but were already known to have thyroid dysfunction.

Figure 1 Flow Chart of inclusion of patients



Thirty-six patients (25 males, 11 females) had abnormal thyroid function tests at presentation with ACS. Thyroid dysfunction is common among patients presenting with ACS in Malta- 41% of our cohort were newly diagnosed with thyroid dysfunction on admission. Fifty nine percent of the cohort was euthyroid at presentation. The most common thyroid dysfunction was subclinical hypothyroidism which represented 17% of the cohort followed by subclinical hyperthyroidism in 12.5% of the cohort. 9% were overtly hypothyroid and 2.2% were overtly hyperthyroid. There were no patients who met the criteria for sick euthyroid syndrome given the available thyroid hormone parameters.

The mean age of all patients was 62.3 years and there was no difference in baseline characteristics between males and females, as shown in table 2 below.

There was no definitive correlation between age and TSH and age and T4 as shown in Figure 2. Nonetheless, available data suggests a trend towards a weak correlation between TSH and age with a p value of *0.055*.

Normal thyroid and different abnormal thyroid cohorts were compared as shown in Table 3. TSH and fT4 levels were significantly different, as expected. There were no differences in age, RBG, and cholesterol across different thyroid categories.

Table 2 Baseline characteristics for all patients [Mean (SD) or frequency [%]* values]

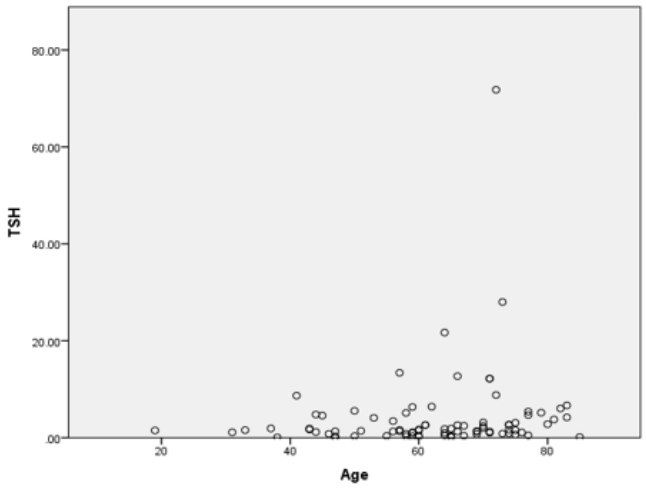
Baseline characteristic	*Males and females (N=88)*	*Males (n=52)*	*Females (n=36)*	*p value* [1]
Age (years)	62.32 (13.44)	61.94 (12.70)	62.86 (14.60)	*0.619* [2]
TSH (mIU/L)	4.08 (8.74)	4.70 (10.65)	3.16 (4.75)	*0.515* [2]
FT4 (pmol/L)	15.56 (5.00)	15.33 (4.17)	16.13 (6.79)	*0.909* [2]
Random plasma glucose (mmol/L)	9.30 (4.78)	8.76 (3.63)	10.17 (6.19)	*0.608* [2]
LDL-cholesterol (mmol/L)	3.60 (1.25)	3.62 (1.08)	3.54 (1.53)	*0.468* [2]
HDL-cholesterol (mmol/L)	1.32 (0.37)	1.28 (0.22)	1.39 (0.54)	*0.221* [2]
total cholesterol (mmol/L)	5.68 (1.48)	5.82 (1.29)	5.43 (1.80)	*0.463* [2]
suffered from diabetes at presentation*	20 (22.72)	12 (13.63)	8 (9.09)	*0.905* [3]

[1] two-sided p value for the difference between male and female subgroups

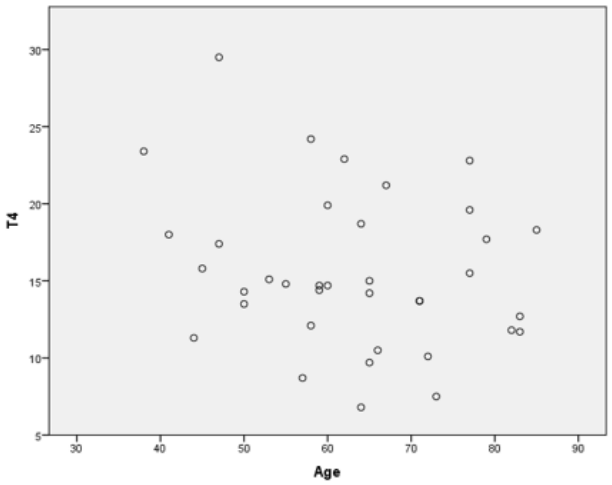
[2] Mann-Whitney U test

[3] Chi Square test

Figure 2 Correlation between age and TSH and age and T4



Spearman's rho = 0.210
p=0.055



Spearman's rho = -0.187
p=0.268

Table 3 Baseline characteristics [median values] or frequency* by thyroid category for all patients

Baseline characteristic	*Euthyroid (n= 52)*	*Overt Hypothyroid (n = 8)*	*Subclinical Hypothyroid (n=15)*	*Subclinical Hyperthyroid (n=11)*	*Overt Hyperthyroid (n=2)*	*p value* [1]
Age (years)	64	68	67	60	42.5	*0.175*
TSH (mIU/L)	1.5	13.05	5.48	0.30	0.05	*0.000*
Ft4 (pmol/L)	19.15	10.5	15.10	14.70	26.45	*0.003*
Random plasma glucose (mmol/L)	7.95	6.6	7.6	7.6	7.37	*0.281*
LDL-cholesterol (mmol/L)	3.41	4.17	3.31	2.96	2.18	*0.80*
HDL-cholesterol (mmol/L)	1.32	1.27	1.32	1.17	1.01	*0.144*
Total cholesterol (mmol/L)	5.66	6.21	5.85	5.19	3.94	*0.102*
suffered from diabetes at presentation*	13	1	6	0	0	*0.217*

[1] Independent Samples Kruskal-Wallis test

Figure 3 shows thyroid status at presentation: 52 patients were euthyroid, 8 were hypothyroid, 15 were subclinically hypothyroid, 2 were hyperthyroid and 11 were subclinically hyperthyroid.

There was no difference in counts of thyroid categories across the genders although one can say there is a trend towards some difference with a p value of *0.051 (Chi squared)*. There was also no difference in age across patients with different thyroid categories *(p=0.175- Independent Samples Kruskall Wallis test)*.

Numbers were very small. In order to perform further survival statistics, patients were divided in 2 different groups as normal thyroid function and abnormal thyroid function on admission. There was no difference in survival status between the 2 groups- *p=0.262 (Chi squared)*. As shown in Table 4.

Figure 3 Thyroid status at presentation with acute coronary syndrome

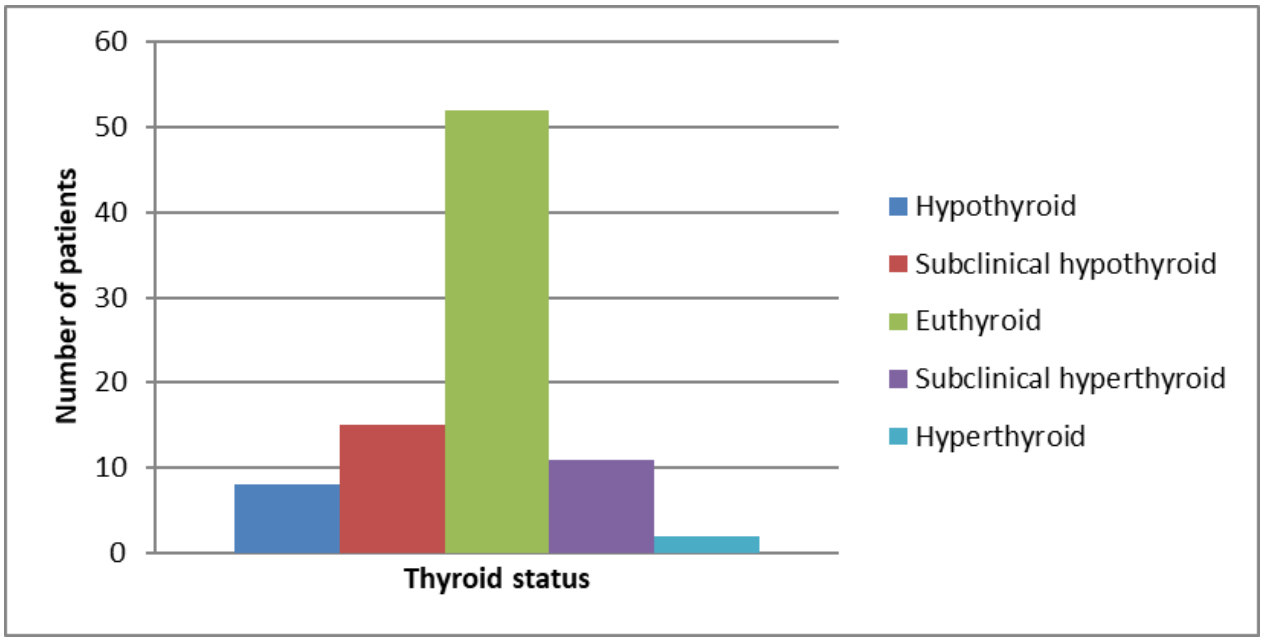


Table 4 Deaths according to thyroid status

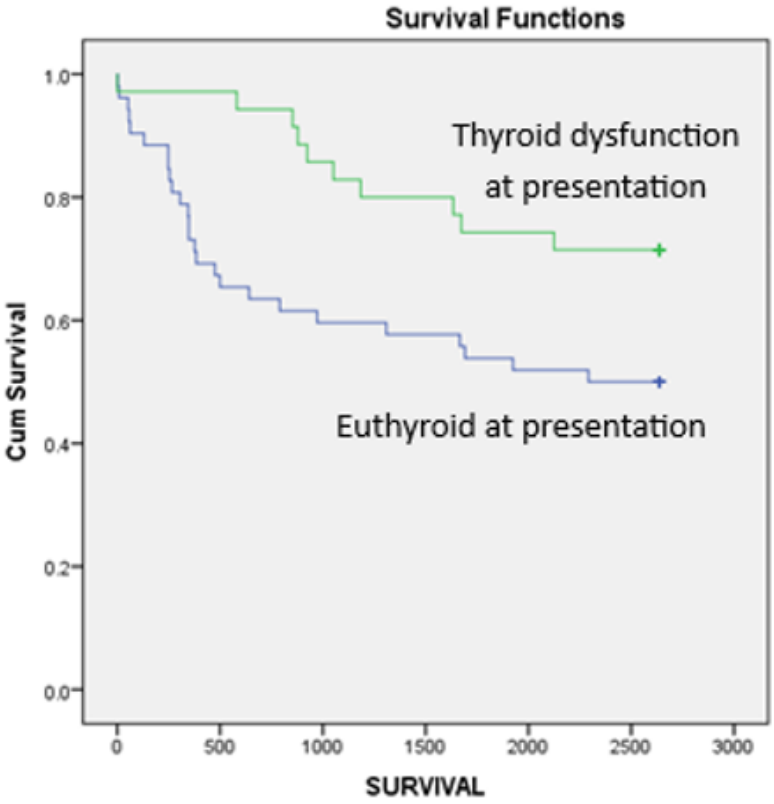
Thyroid status	Euthyroid	Abnormal thyroid function	*p value*[1]
Survived	36	15	
Died	30	7	*0.262*

Table 5 Mean survival times for patients presenting with an acute coronary syndrome, stratified by thyroid status

Thyroid status	Mean survival time	Lower 95% CI	Upper 95% CI
Euthyroid at presentation	1620.02	1318.51	1921.53
Thyroid dysfunction at presentation	2194.40	1941.77	2447.03

Kaplan-Meier curve was performed to check for any differences in survival between patients with normal and abnormal thyroid function (Log rank test with a p value of *0.191*). They were followed up for a maximum of 2636 days (Table 5 and Figure 4). By the end of the observation period in 2010, 20 male and 17 female patients had died. Causes of death stratified by thyroid status at presentation are summarised in table 6.

Figure 4 Kaplan-Meier curves comparing time to death for euthyroid patients and those with thyroid dysfunction at presentation with an acute coronary syndrome



Log-rank test *p*=0.027

Table 6 Causes of death across thyroid categories

Cause of death	Normal thyroid status	Thyroid dysfunction
Ischaemic/ congestive heart disease	5	2
Cerebrovascular accident	0	2
Other causes including pneumonia, sepsis	3	3
Unknown cause	18	4

Discussion

As discussed previously, the most common thyroid dysfunction was subclinical hypothyroidism (15% of the cohort) followed by 12% who were subclinical hyperthyroid. Of note, no patients were noticed to have thyroid function tests showing the sick euthyroid pattern which would be expected in a hospital cohort. Low T3 levels post myocardial infarction due to sick euthyroid syndrome have been associated with molecular changes which cause depressed myocardial function and have been implicated in the potential development of heart failure post infarction.[43] Our patients had their blood tests taken on admission, potentially prior to the occurrence of a sick euthyroid state although the lack of routine FT3 and rT3 estimations at the laboratory poses a limitation. However, T4 and TSH data did not show isolated hypothyroxinaemia.

A significant number of patients (42.05%) died during follow-up. Analysis of biochemistry results of the whole cohort on admission, revealed that twenty one percent of the cohort had been diagnosed with diabetes and a significant number had additional co-morbidities apart from coronary artery disease.

We report shorter survival times for patients who are euthyroid at presentation with an ACS, a finding that was unexpected. Most studies in the field have shown the opposite.[44-45] An explanation for this result could be the small numbers involved. Another reason could be the methodology in having grouped all thyroid dysfunction (hypothyroid and hyperthyroid) patients together in one cohort. In our cohort the euthyroid group had more diabetics than the dysthyroid group. This may have masked any opposing effects of these conditions.

In our study, there were 27 euthyroid males and 25 euthyroid females and a total of 25 male patients with thyroid dysfunction and 11 female patients with thyroid dysfunction. This is unusual as thyroid dysfunction is generally more common in females than males. In addition, women with IHD have higher rates of death compared to men after myocardial infarction[46]. It is possible that females in this cohort had more comorbidities eg higher RBG in women. Therefore, it could be that our results show a reverse mortality trend due to the gender bias, i.e. more males and hence less mortality.

A possible explanation may be that patients who have thyroid dysfunction are inevitably followed up because of the thyroid dysfunction itself and hence other issues may be picked up earlier and treated accordingly improving their survival compared to euthyroid patients.

Another explanation for our results could be that having thyroid dysfunction itself might have been the reason for the patients' ACS and hence this was easily treatable, thus decreasing mortality. On the other hand, patients who were euthyroid and had ACS, probably had non-reversible or difficult to treat causes for their IHD like hereditary causes, smoking or significant co-morbidities.

Limiting Factors

The whole cohort was a convenience sample and therefore it may not represent a normal distribution. As discussed already we had very small numbers and in addition many more male patients than female patients which may have skewed the results. Follow up data collection was retrospective and 68 case notes were unavailable (Figure 1). Hence these patients were lost to follow-up and not included in the

study. This amounted to almost a third of the cohort.

Diabetes has a huge impact in the outcome of ACS treatment. Twenty percent of our cohort had diabetes at presentation and this may have influenced their outcomes (*n*=20 of which 13 where euthyroid and 7 were dysthyroid). Management of patients of ACS varies starting from PCI to conservative management. We did not collect any data about the management of the ACS since this was beyond the scope of our study. However, the outcomes of these patients definitely may have been influenced by the type of treatment for their ACS.

Another problem was the methodology used for the Kaplan Meier analysis in grouping normal thyroid function group and abnormal thyroid function group. In grouping the different thyroid categories the analysis may have been skewed. Given the findings reported here, there is clearly a need for a larger prospective, case controlled study with prospective data collection and analysis.

Conclusions

Thyroid dysfunction is common among patients presenting with ACS in Malta, the most common being subclinical hypothyroidism. We report and discuss the observed shorter survival times for patients who are euthyroid at presentation with an acute coronary syndrome.

Summary Box

What is already known about this subject:

- Current data on mortality is not conclusive.
- Overt hypothyroidism and hyperthyroidism are linked to adverse CV outcomes.
- Various studies have also shown that even in subclinical hypothyroidism and subclinical hyperthyroidism there is an increase in CV morbidity and mortality.

What are the new findings:

- Thyroid dysfunction is common among patients presenting with ACS in Malta. Diabetes was also very common in the above cohort which may be a confounding factor.
- The most common dysfunction being subclinical hypothyroidism.
- We report shorter survival times for patients who are euthyroid at presentation with an acute coronary syndrome which is in contrast to other studies.

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MMJ

ORIGINAL ARTICLE

Anterior Cruciate Ligament Reconstruction: Antero-medial Portal *vs* Trans-Tibial Femoral Tunnel Drilling

Luke Saliba, Dorian Xuereb, Lucienne Attard, Ivan Esposito

Introduction

The anterior cruciate ligament (ACL) is an important part of the function of the knee joint. Rupture is common in sporting activities and the resulting instability can preclude athletes from pursuing their sport. A more anatomical technique of drilling of the femoral tunnel in repair of this ligament has been reported to yield better functional outcomes than non-anatomical techniques.

Aim

The aim of this study is to compare functional outcomes of single bundle, bone - patellar tendon - bone, ACL repair using a trans-tibial approach versus an anteromedial portal to drilling of the femoral tunnel.

Method

This was a retrospective study. A total of 43 patients having had surgery were recruited. Each of these patients were operated using an anteromedial approach to femoral tunnel drilling. IKDC (International Knee Documentation Committee) scores were implemented and each patient was asked whether or not they returned to sporting activities 12 months after surgery. The results were compared to those from previous patients having undergone surgery with femoral tunnel drilling through a trans-tibial approach instead.

Results

The results from our study show that the functional status of individuals having undergone ACL reconstruction are significantly improved when an anteromedial approach was adopted over a trans-tibial approach to drilling of the femoral tunnel. This is evidenced by higher IKDC (International Knee Documentation Committee) scores with less 'Below average' and 'Poor' results. A total of 41.5% of patients in the anteromedial approach group had excellent results compared to 36.9% of patients in the trans-tibial approach group. The anteromedial approach also allowed for 86% of patients to return to sport at 1 year after surgery versus 60% with the trans-tibial approach, a statistically significant difference with a p-value of 0.0019.

Conclusion

The results from an anteromedial portal approach to femoral tunnel drilling were superior to a trans-tibial approach. Functional outcomes were improved and on the basis of this study, an anteromedial approach would be recommended over a trans-tibial approach.

Luke Saliba* MD MRCS(Glasg)
Department of Orthopaedics,
Trauma and Sports Medicine
Mater Dei Hospital
Msida, Malta
lsaliba92@gmail.com

Dorian Xuereb MD FRCS(Edi)
Department of Orthopaedics,
Trauma and Sports Medicine
Mater Dei Hospital
Msida, Malta

Lucienne Attard MD FFSEM(UK)
Department of Orthopaedics,
Trauma and Sports Medicine
Mater Dei Hospital
Msida, Malta

Ivan Esposito MD FRCS(Eng)
Department of Orthopaedics,
Trauma and Sports Medicine
Mater Dei Hospital
Msida, Malta

*Corresponding author

Introduction

The Anterior and Posterior Cruciate Ligaments (ACL and PCL, respectively) are integral components of the knee joint. Along with other soft tissue structures, the ACL and PCL help to confer stability to the knee joint, preventing anterior and posterior translation respectively, of the tibia on the femur.[1] Because of its stabilising role, the ACL may be exposed to tremendous multi-planar forces during strenuous multidirectional and rotational activities activities such as football which may result in compromise of this important ligament.[2] ACL rupture may cause instability of the knee joint, especially in persons with a lack of other stabilisers of the joint, such as under-developed surrounding musculature. The resulting injury and instability may cause a 'distrust' of the knee and may even preclude athletes from pursuing their sport. Current orthopaedic practice offers the possibility of reconstruction of this ligament thereby stabilizing the knee but such an operation affecting a joint so crucial to mobility requires a sound understanding of the knee's anatomy in order to attain good functional outcomes, not least because of the potential for degeneration of the joint in the long-term.[3]

The ACL is a ligament which runs from the medial aspect of the lateral femoral condyle superiorly to a more anterior, medial and inferior position on the tibial eminence. The ligament is actually formed by two separate posterolateral and anteromedial bundles.[4] These bundles become taut during different movements of the knee joint and therefore provide stability during different movements of the knee, effectively performing different functions. The posterolateral bundle of the ACL is taut during extension of the knee joint and confers mostly rotational stability at this extreme of movement. The anteromedial bundle of the ACL on the other hand is taut mostly during flexion and confers mainly anteroposterior stability, preventing anterior translation of the tibia on the femur.[5]

Some forms of surgery employ this specific anatomical knowledge using a so-called double-bundle technique of ACL grafting but other surgeons prefer to use a single-bundle technique for ACL reconstruction. There have been mixed results, however, with no definite consensus on which yields better results.[6-8] In addition to this anatomical knowledge, the ACL's attachment to both the tibia and femur are also important if an adequate reconstruction is to be performed. This ligament's femoral attachment is circular to oval in shape and lies posterior to a landmark known as the lateral intercondylar ridge (Resident's Ridge), with the posterior edge marked by the condyle's posterior cortex. The main load-bearing part of the ACL consists of 'direct' fibres which enter the condyle at an angle approaching 90 degrees (horizontal). There exist more 'indirect' fibres which fan off from the main bulk of the ligament and are thought to bear only a small portion of the load on the ACL.[4, 9-10]

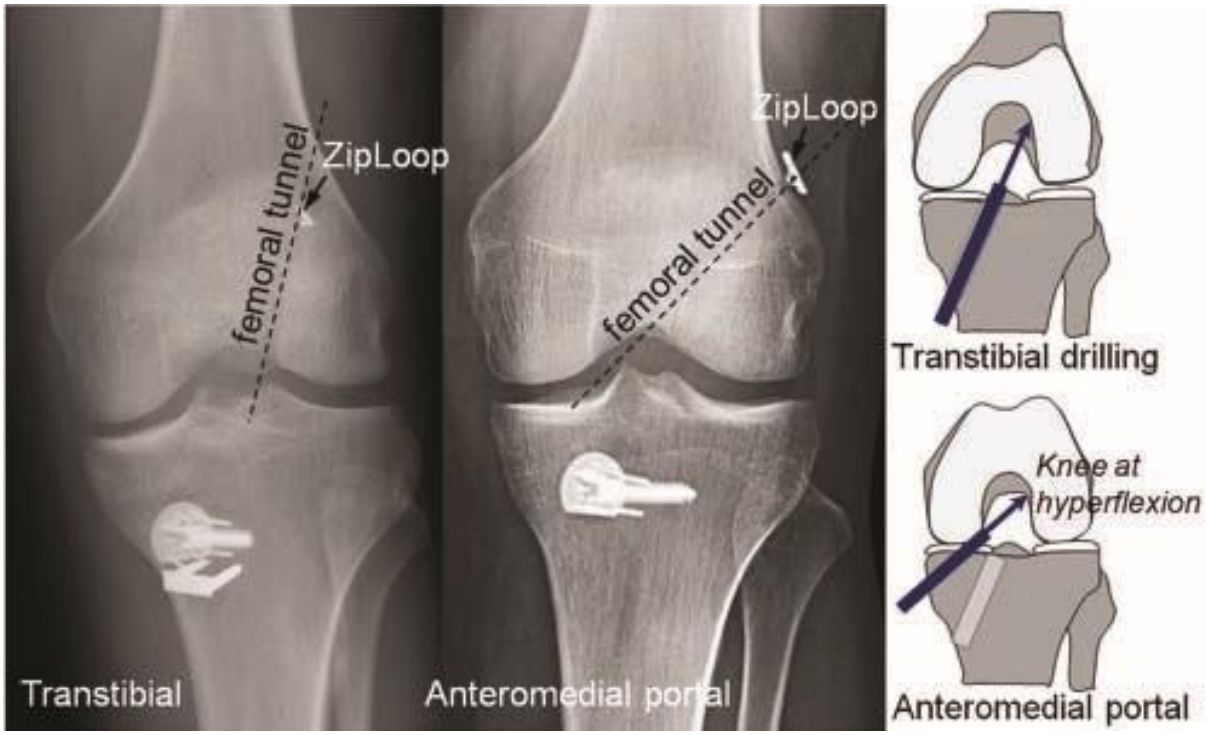
The ACL's footprint is important to bear in mind during reconstruction as anatomical reconstruction requires the femoral footprint of the graft to be placed through the ACL's native footprint. There is a growing body of evidence to support a more anatomical placement of the femoral footprint of the ACL during reconstruction.[11] Trans-tibial drilling of the femoral tunnel does not respect the native ACL's anatomy and so this reconstruction is considered non-anatomical. More modern techniques of ACL reconstruction have in fact shifted to a more anatomical method of

reconstruction with one such method using an anteromedial portal to the knee joint in order to drill the femoral tunnel. This approach allows the femoral tunnel to be placed in the footprint of the native ACL, with an insertion angle of the graft that resembles anatomical specimens. Results of such reconstructions appear to be more promising.[12-15]

The biomechanics of the knee joint are dependant on its anatomy but allow for a deeper understanding of the mechanisms of injury and subsequent pathophysiology. Being a synovial joint with a significant soft tissue component (including both menisci), the knee exhibits two main movements, these being rolling and gliding. Both medial and lateral tibio-femoral points of contact are able to perform both these movements, gliding occurring mostly in flexion with rolling occurring towards extension.[16] In spite of this however, differences between the two compartments occur during extension when rolling preferentially occurs within the lateral compartment. This becomes more obvious at the extremes of extension when a greater gliding movement in the medial compartment allows the tibia to externally rotate on the femur. This movement puts significant strain on the posterolateral bundle of the ACL, the reason for which this ligament may be injured during forced extension of the knee joint such as kicking a football. On the other hand, the anteromedial bundle of the ACL is put to work mainly in flexion where gliding becomes a more prominent movement of the joint, placing more strain on the anteromedial bundle of the ACL.[17]

This study aims to examine the results of autologous Bone-Patellar Tendon-Bone (B-PT-B) single bundle ACL reconstruction with drilling of the femoral tunnel through the anteromedial portal and compare these to those obtained from a previous audit in the same centre but using trans-tibial drilling of the femoral tunnel. (Figure 1).

Figure 1 Anteromedial and Trans-tibial approaches to drilling of the femoral tunnel.[18]



Materials and Methods

A list of patients who underwent ACL reconstructive surgery as performed by a single orthopaedic surgeon during the period between March 2017 and April 2018 was sorted according to the inclusion and exclusion criteria as listed below and patients were contacted retrospectively by phone. Once contacted, patients were explained the reason for the interview and verbal consent was obtained from every patient. Demographic details and each patient's status with regards to previous sport and return to sport after the procedure were also recorded. International Knee Documentation Committee (IKDC) forms were completed and a performance score was calculated for each patient. Application of the IKDC form involved the patient responding to a standard set of questions in order to document their current pain and functional status with regards to ACL reconstruction. If any queries arose, consent was gained in order to review the operating notes. The data gained was then tabulated and comparisons made to an audit performed a few years prior (2005-2008). This audit was carried out in the same centre by the same operating surgeon but using a trans-tibial approach to femoral tunnel drilling rather than an anteromedial approach and used the same parameters for evaluation (IKDC score and return to sport). A *p*-value was then calculated using a Z-test for two proportions, comparing the likelihood of return to sporting activities after each approach.

Inclusion Criteria:

- All patients undergoing single bundle B-PT-B ACL reconstruction via the an anteromedial portal under the care of a single operating surgeon, operated between March 2017 and April 2018

Exclusion Criteria:

- Patients who had not yet had 12 months of post-operative recovery and physiotherapy at the time of data collection
- Patients who had other ligamentous injury noted either intra-operatively or radiographically
- Patients having revision ACL surgery
- Patients having autologous grafts other than B-PT-B
- Patients having a synthetic graft implanted
- Patients having anything other than Meniscectomy performed during the same procedure
- Patients having prior surgery on the same knee other than simple meniscectomy

Results

A total of 83 patients were found to have had ACL reconstruction procedures between the months of March 2017 and April 2018. Of these patients, 40 were excluded. Of the 40 excluded, 1 patient refused to take part in the study and a further 6 could not be traced or contacted. The remaining 33 patients had procedures which included synthetic graft implantation, revision surgery or previous surgeries for more complex meniscal injuries. This left 43 patients who were eligible for this study and these were contacted in turn and asked for consent to partake in the study.

Of the 43 patients, 35 (81.4%) practised football as their primary sport with other sports including rugby, skiing and martial arts among others. All 43 patients did some form of sport prior to injury, most being injured while playing their sport of choice. 65.1% of injuries

(28 patients) involved a twisting injury, often when changing direction suddenly while practicing their sport. The majority of patients were male (38 or 88.4%) with only 5 (11.6%) patients being female.

The age of patients included in the study had ages which ranged from 17 to 36 with mean and median ages of 26 and a mode of 29. A total of 25 patients (58%) had a meniscectomy performed at the same operation with 2 patients (4.7%) having had previous arthroscopy. One of these 2 patients had a meniscectomy performed in the first operative procedure.

The results of a previous audit performed in the same centre between 2005 and 2008 are included in table 1 below for comparison, this audit having included a total of 83 patients.

Table 1 International Knee Documentation Committee (IKDC) Score Results

IKDC Category	IKDC Score	Number of Patients (Anteromedial Portal)	Percentage Patients (Anteromedial Portal)	Percentage Patients (Trans-Tibial Approach)*
Excellent	90 - 100	18	41.9%	36.5%
Very Good	80 < 90	12	27.9%	32.4%
Good	70 < 80	10	23.2%	20.3%
Average	60 < 70	3	7%	0%
Below Average	50 < 60	0	0%	4.1%
Poor	<50	0	0%	6.8%

*'Trans-Tibial' data reproduced with permission from Mr. Dorian Xuereb MD FRCS (Edi), Dr. Lucienne Attard MD FFSEM (UK) and Mr. Ivan Esposito MD FRCS (Eng)

Discussion

The ACL is an important ligament for normal knee biomechanics. Unfortunately however, it is often subject to trauma, especially during sporting activities requiring sudden changes in movement such as football and volleyball. For this reason, it is important to consider the restoration of normal biomechanics when reconstructing this ligament. In order to do this however a sound anatomical knowledge is required in order to respect the native ACLs anatomy and consequently the normal biomechanics of the knee as best as possible. Indeed, current literature agrees that an anatomical reconstruction of the ACL affords better biomechanics to the operated knee over a less anatomical reconstruction.[19]

Considering the importance of anatomy in ACL reconstruction, an anteromedial approach to drilling of the femoral tunnel has been studied in an attempt to improve the ACL graft's anatomy. Doing this may hence improve the biomechanics of the operated knee with

benefits for the patient, including a better functional status, especially when considering high demand activities such as football and other sports. Current evidence is in agreement that an anteromedial approach to drilling of the femoral tunnel provides a better anatomical result when compared to a trans-tibial approach. This is because it allows for positioning of the ACL graft within the native ACL footprint and also a more horizontal placement of the graft within the femoral condyle, similar to native ACL anatomy.[13,20-23]

In this study, the authors compare the results of an anteromedial portal approach versus a trans-tibial approach to drilling of the femoral tunnel in ACL reconstruction. In order to do this, a well-documented and validated score was implemented, the IKDC score. This incorporates a number of questions targeted at different aspects of the operated knee's status including pain, ability to perform activities such as climbing stairs and also more strenuous activities such as sports. In doing this, the authors were able to deduce that patients having had ACL reconstruction with femoral tunnel drilling through an anteromedial portal had better functional results when compared to a trans-tibial approach. This was evidenced by a shift of the IKDC score in the anteromedial approach group toward the upper range with no patients having recorded 'Below average' or 'Poor' results as compared to 10.9% of patients in the trans-tibial approach group having recorded these results. In addition to this, an anteromedial approach resulted in a higher rate of return to sport with a total of 86% of patients returning to regular sporting activities compared to a more modest 60% of patients in the trans-tibial group, this difference reaching statistical significance. This figure is of particular interest as it signifies the ability of the anteromedial approach to offer a better result to the patient with regards to return to pre-morbid state and function. This in turn may also translate into a better quality of life and improved patient satisfaction.

The results reported here in this study are congruent with the results of other studies published in the literature. Other reports also show an increased rate of return to sport with some also showing improved recovery times. [(24)] In addition to this, there is also evidence to suggest that revision rate may be lower with an anteromedial approach.[25]

This study was carried out using the data from the same operating surgeon who was similarly experienced in both techniques. This affords a chance to better compare the techniques themselves as there is no operator difference to consider here. In contrast to this, considering data from a single operating surgeon may mean that results are less relatable to the more general orthopaedic community, especially considering that this particular operating surgeon specialises particularly in this field of orthopaedics. It must also be mentioned that the present study considers relatively low patient numbers. Having said this however, it must be stressed that an anatomical reconstruction of the ACL is of utmost importance and an anteromedial portal approach allows anatomy to be respected better than a trans-tibial approach. If the operator is able to perform either technique therefore, the authors of this study suggest an anteromedial approach to drilling of the femoral tunnel over a trans-tibial approach as there is now a good evidence bank to support this method.

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ORIGINAL ARTICLE

Pre-operative fasting times in paediatric patients admitted to the Orthopaedic Department

Gabriella Grech, Martin Camilleri

Background

Recent research has shown that children are often fasted for unnecessarily long intervals and that prolonged fasting could have detrimental metabolic and behavioural effects in small children. In 2011, the European Society of Anaesthesiology proposed the 6-4-2 regimen for pre-operative fasting in paediatric patients. Solids, including semi-solid food and milk-containing products should be avoided 6 hours before anaesthesia induction, whilst breast milk and clear fluids, should be avoided 4 hours and 2 hours before anaesthesia induction respectively.

Methods

Patients, aged 16 years and younger, requiring emergency surgery within the Orthopaedic department over a period of three months, were included in this audit. 49 patients were identified from the trauma lists issued daily by the Orthopaedic Department. Data was collected from patients' case notes.

Results

Out of 41 patients, 22 patients (54%) were advised to remain starved from fluids and solids from 2 am in the morning. On the other hand, 37% of the patients (15 patients) were advised to remain starved from midnight.

Conclusion

The majority of doctors that admit paediatric patients within the Orthopaedic Department seem to be unaware of the guidelines from the European Society of Anaesthesiology regarding pre-operative fasting times in children. As a result, these patients are fasted for unnecessarily long intervals leading to detrimental metabolic and behavioural effects.

Gabriella Grech* MD, MRCS, M.Ch;
Department of Paediatric Surgery,
Mater Dei Hospital
Msida Malta
gabriellagrech15@gmail.com

Martin Camilleri MD, MRCS, PG Dip Sports Medicine
Department of Orthopaedic Surgery,
Mater Dei Hopsital
Msida, Malta

*Corresponding author

Background

Recent research has shown that children are often fasted for unnecessarily long intervals and that prolonged fasting could have detrimental metabolic and behavioural effects in small children. Moreover, reducing fasting intervals to less than 2 hours, may be safe and result in a reduced risk of negative metabolic effects of fasting.[1]

In 2011, the European Society of Anaesthesiology proposed the 6-4-2 regimen for pre-operative fasting in paediatric patients. Solids, including semi-solid food and milk-containing products should be avoided 6 hours before anaesthesia induction, whilst breast milk and, clear fluids should be avoided 4 hours and 2 hours before anaesthesia induction respectively.[2]

The aim of preoperative fasting is to minimise the risk of pulmonary aspiration of gastric contents, as a result of regurgitation and loss of protective airway reflexes by anaesthetic agents.[1] Aspiration of gastric contents is an uncommon event but can lead to devastating consequences.[3] The current European guidelines have a good track record, as a recent audit of almost 120,000 cases in the United Kingdom, had a reported incidence of pulmonary aspiration of 0.02%.[4]

Moreover, there is no definite evidence that links the length of pre-operative fasting with risk of pulmonary aspiration during anaesthesia. Several studies have shown that it is likely that a child's last drink before surgery would have passed through the stomach within less than an hour.[1] On the other hand, a study carried out by Van de Putte et al. (2017) showed that a 2 hour fasting interval for fluids does not guarantee an empty stomach.[5]

Prolonged fasting in the paediatric population has been shown to increase the incidence of hypoglycaemia, metabolic acidosis, dehydration, cardiovascular instability, discomfort, hunger, thirst and grumpiness.[6]

Materials and Methods

Aim

The aim of this clinical audit project is to assess compliance with current guidelines regarding pre-operative fasting times in paediatric patients. If compliance is found to be poor, recommendations for change should be made, which include further education to the surgical teams within the Orthopaedic Department.

Objectives

The objective is to determine whether or not paediatric patients and their parents, are given the appropriate advice regarding pre-operative fasting.

Standards

Peri-operative fasting in adults and children: guidelines from the European Society of Anaesthesiology are used to measure current practice. The guidelines advise that children should be starved 6 hours from solid, 4 hrs from breast milk and 2 hours from clear fluids pre-operatively.

Methodology

Patients aged 16 years and younger requiring emergency surgery within the Orthopaedics department were included in this audit. This is a retrospective audit looking at admissions from 9th May 2019 to 9th August 2019. 49 patients were identified from the trauma lists issued daily by the Orthopaedic Department. Data was collected from patients' case notes and this was inputted into and analysed using Microsoft Excel.

Results

A total of 41 case notes were reviewed. In the case of 6 patients, the case notes were not retrieved as they were still in use at outpatients' clinics. 1 patient's case notes were not available for an unknown reason while for another patient no notes regarding the concerned admission were found in his case notes.

Discussion

The mean age of the population audited was 7.71 years. The youngest patient was 5 weeks old while the oldest patient was 16 years old. The population studied was almost equally distributed into the 3 age groups: ≤5 years old; 6 – 10 year old; 11 – 16 years old (Refer to Table 1). The majority of patients, 26 out of 41 patients (63%), were male while 37% (15 out of 41 patients) were female.

Out of 41 patients, 22 patients (54%) were advised to remain starved from fluids and solids from 2 am in the morning (Refer to Table 2). As a result, these patients were kept nil by mouth for at least 6 hours and 30 minutes, keeping in mind that usually the first case on the trauma list starts at 8.30am. This is in keeping with the guidelines regarding starvation from solids but not in the case of clear fluids.

15 patients, (37%) were advised to remain starved from midnight (Refer to Table 2). These patients were kept nil by mouth for at least 8 hours and 30 minutes. This period was even longer in cases where the patient was not done first on the trauma list. This usually occurs when other cases take priority, such as a younger patient or when a life/limb threatening case is admitted.

In 9% of the patients (i.e. 4 patients), it was noted that they were operated on the same day of admission and no clear documentation was available in the case notes regarding the advice that the patients and their parents were given. No documentation about the period of starvation was noted as well.

Out of the 22 patients who were starved from 2am, 4 of them were reviewed at around 2am by the orthopaedic trainees. It is possible that different advice would have been given if the patient was reviewed at an earlier time during the night.

Table 1 Demographic data of the population studied

		Number of patients	Percentage
Total		41	100%
Age	*Mean: 7.71*		
	≤ 5 years old	14	34%
	6 - 10 years old	12	29%
	11 - 16 years old	15	37%
Sex	Male	26	63%
	Female	15	37%

Table 2 Data on advice given to paediatric admissions regarding pre-operative fasting

		Number of patients	Percentage
Advice given	Starve from Midnight	15	37%
	Starve from 2am	22*	54%
Surgery done on same day of admission		4**	9%

*4 of which were reviewed at around 2am
**No clear documentation was available on how long the patient was starved.

Conclusion

The majority of doctors that admit paediatric patients within the Orthopaedic Department seem to be unaware of the guidelines from the European Society of Anaesthesiology regarding pre-operative fasting times in children. As a result, these patients are fasted for unnecessarily long intervals leading to detrimental metabolic and behavioural effects.

The authors suggest teaching sessions on peri-operative care of such paediatric patients to be included in the surgical training programme. Moreover, it would be interesting to carry out similar audits in other surgical departments that operate on paediatric patients, to improve current practices and, create more awareness of these guidelines and the detrimental effects of prolonged fasting in children.

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ORIGINAL ARTICLE

The impact of COVID-19 on fitness behaviour amongst a sample of the Maltese population

Danica Cassar, Claire Bonello, Kimberly Georgie Grixti, Nicola Falzon, Matthew Bartolo

Background

The global pandemic of COVID-19 has brought significant changes all over the world, including Malta. These changes might have impacted people's health and their lifestyle. Such changes might have limited health and fitness behaviours such as frequency of exercise, intensity of exercise and water intake. Therefore, this study aims to examine and explore how the COVID-19 pandemic has impacted fitness behaviours amongst a sample of the Maltese population.

Methods

The sample (*n*=995) was selected through convenience sampling. Data was collected through an online 38-item survey which was dispersed on social media during April and May 2020. The questions measured the frequency of health behaviours to provide a comparison between the participant's health behaviours in November 2019 and April 2020, during the COVID-19 pandemic.

Results

The data was analysed through Factor Analysis which was conducted for dimension reduction. Factor analysis resulted in one factor composed of three variables (frequency of exercise, intensity of exercise and water consumption). Further analyses were conducted using a paired samples t-test on SPSS. Following analysis, the results showed that there was an increase in exercise frequency amongst the sample population, whereas there was a decrease in exercise intensity and water consumption. These results confirm that there was a change in health behaviours amongst the study's sample.

Conclusion

This study recommends further investigation as to understand this difference in behaviours and its attributes. This can help inform health behaviours should there be further waves of the pandemic or other lockdowns.

Danica Cassar* B.Psy (Hons) (Melit.) MBPss
Willingness Clinic
Żebbuġ, Malta
danica@willingness.com.mt

Claire Bonello B.Psy (Hons) (Melit.)
Willingness Clinic
Żebbuġ, Malta

Kimberly Georgie Grixti B.A in Italian & Psychology
Willingness Clinic
Żebbuġ, Malta

Nicola Falzon B.Psy (Hons) (Melit.)
Willingness Clinic
Żebbuġ, Malta

Matthew Bartolo MSc Sex & Rel. Psych. (Sheff Hallam); PGCE; Pg AdvDip. in Couns. (CPPD); B.Psy (Hons.)
Willingness Clinic
Żebbuġ, Malta

*Corresponding author

Introduction

The novice pandemic, COVID-19 has brought about significant changes across the world. Research about the impact of the pandemic is still growing and developing, however, there is a minimal understanding about the impact of COVID-19 on people's health and lifestyle. Despite the limited research available, emerging studies show that the pandemic did impact people's health and lifestyle.[1-4] In fact, one of the pandemic's impact was seen on physical activity as it posed a challenge to exercising.[5] It has affected people's exercise patterns and frequency levels.[6] Due to the virus' widespread reach and uncertainty, countries encouraged the closure of fitness centres, gyms and physical activity classes amongst other limitations. This was done with the aim to reduce the spread of the virus. The United Nations (2020) suggested that with such closure and limitations of activities, individuals tend to be less physically active and consume less healthy dietary food intake, thus impacting people's lifestyle negatively. In addition to this, the World Health Organization (WHO) (n.d.) emphasised the importance of physical activity during the situation of the pandemic throughout all age groups.

In a recent study looking at exercising behaviour amongst a population in Belgium,[6] it was found that half of the participants exercised more during the pandemic, whilst the other half exhibited more sedentary behaviour during the pandemic. Reasons for not exercising included missing their normal ways of exercising include not having enough time and due to sitting more since they were working from home.[6] This suggests that people's physical activity levels have been affected negatively.

Since reducing the spread of the COVID-19 virus was the main priority throughout this pandemic, issues regarding maintaining physical activity routines, has been left un-tackled.[7] Staying at home has been seen as a fundamental safety measure to limit human to human transmissions, however, it can be said to have brought some negative consequences. One of the most crucial issues is that physical activity can be reduced. Extended periods of time at home can amplify sedentary behaviours such as; immoderate amount of time sitting or lying down to engage in screening activities including playing video games, watching television, or using mobile devices.[7] Excessive home stays may also lead to physical inactivity and higher risks of developing symptoms of anxiety and depression. These in turn may result in the likelihood of chronic health conditions.[7] It is believed that physical inactivity is accountable for approximately 10% of non-communicable diseases globally. Such disorders, among others, could include autoimmune diseases, strokes, heart disease, and diabetes. Moreover, immobility can expedite the loss of functional capacities with aging, which diminishes life expectancy. This brings large consequences such as those acclaimed risk factors like smoking and obesity.[8]

Government measures that limit people`s movements during the COVID-19 pandemic do not convey that physical activity must be eliminated. Exercising has been shown to provide better health for both healthy individuals as well as for patients with various diseases.[7] It does not only constitute as an important aspect of illness prevention but is also serves as a remedy for inactivity-associated disorders. Being physically active can be seen as a non-pharmacological way to boost one's general health.[8] Studies have

shown that frequent training can enhance one's immune retaliation to respiratory pathogens. Maintaining a physically active lifestyle, instead of a sedentary one, can help in managing and restricting infection repercussions. Research also supports that regular and balanced exercise can improve antibacterial and antiviral immune monitoring, decrease swelling, and delay aging.[8]

According to the World Health Organisation (2011), 18- to 64-year-olds should engage in at least 150 minutes per week of moderate-intensity exercise per week. Lack of exercise can lead to diseases and illnesses, such as obesity.[12] A person who exercises frequently increases their chances of having healthier bodies.[11] In Malta, only 25% of 10–11-year-olds and only 36% of 18–64-year-olds practice sufficient physical activity levels.[13] This shows that the majority of 10–11-year-olds and 18–64-year-olds are not meeting the physical activity requirements proposed by the World Health Organisation. In summary, despite the importance and benefits of physical activity, the Maltese population is not exercising enough. [14]

On their website, the World Health Organization[15] also illustrates several home-based exercises and relaxation techniques, which one could implement in their own home. WHO, suggest 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity of exercise each week. These can be easily achieved at home with limited space and without the use of special equipment. They also provide some hints on ways to stay active during the COVID pandemic. They advise the public to take short active breaks throughout the day, which may include dancing, stretching, or performing relaxation exercises for a couple of minutes.[15] One can also choose to follow online classes, watch exercise videos on YouTube, or download applications which be easily accessed through various digital devices.[16] WHO, also exhibits various exercises on their website, highlighting their main objectives. These include workouts to strengthen the physical body as well as exercises that increase heart and breathing rates.[15] Out-door exercising is still an option; however, one should maintain a certain distance from other people.[16]

According to the Harvard T.H. Chan School of Public Health (2006), while there is no singular volume of water that is recommended for individuals as one's need varies depending on food, weather and physical activity, the Guidelines recommend 20-50 ounces (0.6-1.5 litres) of water daily. Having said this, they are still aware of the varying need in water intake amongst individuals, as this depends on one's food consumption, physical activity, environmental factors such as the weather amongst other factors. The UK Food Standards Industry (FSA) similarly recommends 6 to 8 glasses (1.2 litres) per day. A local study of water consumption found a similar distribution for both men and women respondents, with the highest percentage indicating that 67.76% of the respondents consume water 6-7 days per week 18. Drinking water and remaining hydrated, especially after exercise has been found to improve cognitive function [19] and help in dehydration prevention.[20]

When new cases of COVID-19 started emerging in different countries, each country responded in a similar manner by imposing a lockdown to reduce the spread.[6] This is because it has been shown that with lockdown there was a significant decrease in the growth rate of new COVID-19 cases in China.[21] Therefore, each country adopted different levels of lockdown.[6] In Malta, schools, gyms

and public spaces were closed, shopping was limited to necessary shops only and people were encouraged to work from home when possible. The authorities encouraged citizens to remain indoors as much as possible to limit the spread of the virus; they "urged people to only go out if absolutely necessary and to maintain a distance between themselves and others they might come across while outdoors."[22] People were encouraged to go out only for necessities; these included "going to work for a critical reason and for a short period of time; exercising child visitation rights; feeding or caring for animals which are located somewhere other than their home; going to the bank" [22] This suggests that with the closure of gyms and public spaces, together with limited commute to work and only going out for necessities, might have impacted the population's exercising habits. According to the authors' knowledge, there has been no research yet in Malta looking at the impact of COVID-19 on health behaviours. Therefore, this study aims to understand the fitness behaviours amongst the Maltese population during the COVID-19 pandemic, if any.

To help achieve this aim, this study attempts to answer the following research questions:(*RQ1*) Did the Maltese population exercise more or less during the pandemic?

(*RQ2*) Did the Maltese population exercise more or less intensely during the pandemic? And (*RQ3*) Did the Maltese population consume more or less water during the pandemic?

In addition, this study submitted the following hypotheses:

- H0 - There is no significant relationship between the frequency of exercise before and during COVID-19.
- H1 - There is a significant relationship between the frequency of exercise before and during COVID-19.
- H0 - There is no significant relationship between the intensity of exercise before and during COVID-19.
- H1 - There is a significant relationship between the intensity of exercise before and during COVID-19.
- H0 - There is no significant relationship between the consumption of water before and during COVID-19.
- H1 - There is a significant relationship between the consumption of water before and during COVID-19.

METHODS

Materials

To examine the frequency of how people conducted certain behaviours, a quantitative approach was deemed fit. Data was collected through a self-developed 38-item questionnaire. The questions asked about daily behaviours, such as hand washing, exercise, consumption of water, and diet amongst others. Each question required the participants to answer how frequent their health behaviours occurred in November 2019 and at the time of data collection. This questionnaire was designed on Survicate (https://survicate.com), as it offered user-friendly features for the participants. Demographic questions for Gender, Sexual Orientation, Age, Relationship Status and Location were acquired in order to understand the demographics of our sample.

Ethical Consideration

To ensure the conduct of ethical research and protection of participants from any harm, the code of conduct for ethical research was

used[23]. Prior to starting the survey, participants had to provide their consent for participation and were made aware of their rights as participants. Participants had the right to freely withdraw by closing the survey window anytime up until submitting their final answers. This was defined as submissions would be anonymous and confidential, thus limiting the identification and erasing of their data. Participants could change any previous answers freely until their submission. Participants were also given the option to skip any questions they did not wish to answer by leaving that question blank. Participants' participation was kept anonymous in order to maintain their confidentiality and remain unidentifiable. The questions asked in the survey were about daily behaviours therefore, thus limiting the possible ethical risk or harm posed on the participants.

Sample and Data Collections

Participants were recruited through convenience sampling, with the questionnaire being shared on social media platforms including Facebook, Instagram and Twitter. Anyone on these social media platforms could participate after they consent to confidentiality and voluntary participation. Data was collected from 16th April 2020 up to 16th May 2020.

When data collection finished, n=1413 however, the data was looked at and cleaned since there were non-Maltese participants and unfinished entries. After cleaning the data, n = 995. Since variables were categorical, they were re-coded to allow easier data analysis. Data was analysed using IBM SPSS Statistics 26. Factor Analysis was used for dimension reduction and further T-tests were conducted based on the results of the Factor Analysis.[24]

RESULTS

Descriptive Statistics

A total number of 995 participants participated in this survey. An overview of the frequencies of the final demographic sample can be found in Table 1. Most of the sample were females and heterosexual, aged between 31 and 40, and in a relationship.

Inferential Statistics

Factor Analysis was conducted to observe which factors are significant.[24].As a result one factor was observed. This factor was composed of three variables which included (1) intensity of exercise, (2) frequency of exercise and (3) consumption of water. These were grouped together under the name (1) pre-personal fitness and (2) post-personal fitness. Pre-personal fitness refers to the variables measuring the frequency of fitness behaviours in November 2019, whereas post-personal fitness refers to the variables measuring the frequency of fitness behaviours in April 2020.

A paired samples t-test was conducted to compare the participants' drinking water, exercise intensity and exercise frequency before COVID-19, under the computed variable label 'Pre-personal fitness', and their behaviours at the time of data collection, under the computed variable label 'Post-personal fitness'. Through this test, a significant association was found between the variables 'Pre-personal fitness' (M=4.58, SD=1.41) and 'Post-personal fitness' (M=4.45, SD=1.38), t(0.98)=2.57, p<0.01. Results showed that participants drank less water during COVID-19 (M =1.63, SD=.63) when compared to six months before (M=1.70, SD = .64). Whereas participants had increased their exercise frequency during COVID-19 (M=2.91, SD= 1.66) when compared to six months before (M=2.78,

SD=1.56), their intensity levels of exercise during COVID-19 were reduced (*M*=1.37, *SD*=.54) when compared to six months before (*M*=1.49, *SD*=.63). Therefore, this shows that COVID-19 has impacted participant's fitness behaviour by decreasing water consumption and intensity of exercise whilst increasing the frequency of exercise.

Table 1 Demographics of the sample

Characteristic	Number Of Participants
Gender	
Female	751 (75.5%)
Male	240 (24.1%)
Non-Binary	1 (.1%)
Prefer not to say	1.(1%)
Sexual Orientation	
Heterosexual	829 (83.3%)
Homosexual	65 (6.5%)
Asexual	5 (.5%)
Pansexual	5 (.5%)
Bisexual	42 (4.2%)
Other	48 (4.8%)
Age	
15 - 18	45 (4.5%)
19 - 21	122 (12.3%)
22 - 25	215 (21.6%)
26 - 30	212 (21.3%)
31 - 40	233 (23.4%)
41 - 50	113 (11.4%)
51 - 60	41(4.1%)
61+	14 (1.4%)
Relationship Status	
Divorced	3 (.3%)
In a relationship	489 (49.1%)
Married	277 (27.8%)
Separated	21 (2.1%)
Single	203 (20.4%)
Widowed	1 (.1%)

Discussion

This study aimed to understand how COVID-19 might have impacted people's health behaviours. The results confirm that there was a significant relationship between the exercise frequency, exercise intensity and water consumption before and during COVID-19. Therefore, this study rejects the null hypotheses and accepts the alternate hypotheses. These will be discussed further below, through answers for the research questions posed.

As an answer to RQ1, this study found that the frequency of exercise has increased. This increase is like the reported increased frequency of exercise in the study conducted by Constandt et al. (2020). However, this study did not measure any sedentary behaviour and therefore cannot tell if the results of sedentary behaviour were similar or not. This increase in exercise frequency can be contributed to various assumptions. This study assumes that the increase could be due to the accessibility of free fitness material on social and traditional media. During the pandemic, a lot of free physical activity resources were available for people to make use of. Letieri & Furtado (2020) suggested maintaining an exercise regime using social media during lockdown to keep people active. This can therefore suggest that, if free exercise resources or regimes are more available, people can and will exercise more. The relationship between physical activity levels and the availability of resources was not studied directly and therefore, this study suggests further studying on the impact of free resources on fitness.

Another assumption is that due to the lockdown, people being locked inside automatically might have reduced the number of tasks and errands. As a result, some people had more time available and therefore, might have had more time to exercise when compared to before. This is like what was found in study conducted by Constandt et al. (2020), since their participants had an increase in time availability. Another assumption as to why there might have been an increase in exercise frequency, can be attributed to the theory of unavailability.[25] This theory states that items that are scarce and unavailable increase the people's desire to achieve them. Therefore, this argues that since outside behaviour was limited and scarce, people wanted it more and had a higher affinity towards it, hence increasing the chances of exercise. Another assumption could be the fact that, as citizens felt powerless and out of control, they engaged in activities which gave them meaning as well as self-control. Self-control and meaning in life are recognized as psychological resources, which can be fundamental to adapt and cope during major life events.[26] Nevertheless, terrible stressful episodes can stimulate crises of meaning and threaten existential security. Self-control can elucidate the ability to change inner reactions. Moreover, having self-control can also stop undesired behaviour. Meaning in life may help people perceive stressors as a challenge rather than loss.[26] Furthermore, having a purpose can serve as a motivation in times of crisis. COVID-19 has engendered countless changes in one's life, such as job loss and death. Here a person might feel not in control of his own life. Choosing to engage in more physical activities may be one of the reasons people choose, to successfully cope with the traumatic event of the current pandemic.

The final assumption is an increase in exercise frequency to maintain better mental health. Petty, Sharma & Madaan (2006) stated that

physical activity aided individuals to reduce depressive and low moods, whilst also aiding in reducing feelings of anxiety. This means that since the pandemic evoked various levels of anxiety, people might have resorted to physical activity to help them alleviate their stress and mood. All these assumptions made by this study could differ with time and a different sample. This proposes further in-depth qualitative studies as to understand the reasons why people increased their frequency of exercise during the pandemic.[27]

As an answer to RQ2, this study found that the intensity levels of exercise have decreased. Dr Jeffrey A Woods, in an interview with Zhu (2020) claimed that regular and moderate intensity of cardiovascular exercise can have protective factors to one's immunity. This suggest that people's level of intensity need to be moderate to be beneficial.[28] Even though moderate intensity proves to be beneficial, the sample's intensity levels decreased. This difference can be attributed to the closure of gyms and lack of heavy weight equipment at people's home. Even though the intensity of exercise could have been enhanced with different home items, it seems that home exercise still limited the intensity.[8] Apart from the closure of gyms, fitness classes and exercises were also stopped to avoid gatherings of people and therefore might have changed the intensity level. Another assumption about the decrease of intensity can be attributed to people choosing to walk, run or exercise at home as their main form of exercise. This can be due to accessibility and might have changed their intensity levels. In summary, this suggests further qualitative and quantitative studies to understand the difference in intensity between active and non-active people and their attributes.

As an answer to RQ3, this study found that water consumption levels decreased. According to the authors' knowledge, no studies were found that looked at the level of water consumption during COVID-19. In addition, no studies have looked at the level of water consumption amongst the Maltese population. Our results suggest a decrease in consumption which is worth further analysing to identify the relationship between COVID-19 and water intake. Water intake can be assumed to vary due to several factors, such as temperature levels, weather, levels of activity, sedentary behaviours amongst many others. It can be assumed that the decrease in exercise intensity could have led to this change in the levels of water consumption. Therefore, this study recommends further investigation to understand the relationship between exercise and water consumption. This study also suggests delving into the Maltese population's drinking habits and using the data collected to provide comparison with other countries.

Conclusion

The strengths posed by this study include an understanding of how the first wave of the COVID-19 pandemic affected fitness behaviours amongst a sample of the Maltese population. This is useful since the pandemic is expected to result in more than one wave and possibly prevails for a longer period. Therefore, the data collected can be used to shape and formulate guidelines and policies to enhance fitness behaviours amongst the Maltese population.

On the other hand, this study also had its limitations. For example, since participants were recruited through social media, non-social media users were not exposed to the possibility of participating in this research. This population might have had differing views and

experience that would have made the data richer. The sample size was limited as it was not led by G-Power and therefore the results cannot be generalised. The results were based on the participant's recollection and subjective memory of their past and current behaviours and therefore, participants might have been subjected to recall bias. Due to limited resources, there has been no data triangulation such as qualitative surveys, interviews or focus groups to understand deeper how and why there was the change in their fitness behaviours.

In conclusion, this study shows that COVID-19 did leave an impact on fitness behaviours amongst a sample of the Maltese population. The change was noted in exercise frequency, which increased, and a decrease in exercise intensity and water consumption. Further studies are suggested to provide an understanding as to why fitness behaviour differed with the impact of the COVID-19 pandemic. This will help prepare better guidelines for future limitations on fitness behaviours.

Summary box

What is already known about this subject:

- Exercise improves people's lifestyle and overall health
- COVID-19 impacted people's health behaviours, suggesting poorer health

What are the new findings:

- Maltese participants exercised more during the COVID-19 pandemic as opposed to six months before.
- Maltese participants' level of exercise intensity decreased during the COVID-19 pandemic.
- Maltese participants drank less water during the COVID-19 pandemic as opposed to six months before.

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MMJ

ORIGINAL ARTICLE

A cross-sectional survey of Maltese children's physical health during the Coronavirus pandemic lockdown

Amanda Fenech, Simon Attard Montalto

Background

Home-schooling was imposed by many countries in Europe because of the Coronavirus pandemic. This became the new lifestyle for most children, with potentially significant impact on physical activity, sedentary behaviours, weight status and sleeping habits.

Methods

A seven-day recall questionnaire was distributed on local social media groups in Malta. Parents with children under 16 years of age were invited to anonymously fill the five-minute questionnaire on a voluntary basis. Responses were collected over a one-week period in June 2020.

Results

492 valid responses were assessed for children aged 1-15 years (divided into Pre-Primary, Primary and Secondary school-age groups). Of those, only 16.9% of children attained the recommended daily physical activity during the pandemic. 34.6% of all children were found to be overweight or obese. Furthermore, obese children were noted to be significantly less active (p=0.028). Home-schooling averaged 3.25 hours per day in Primary and 3.6 hours in Secondary schoolchildren. Additionally, 95% of children spent at least 2 hours in sedentary activities and longer hours were noted in obese children (p=0.040). The average daily vegetable and fruit intake was 4.21 portions. The sleep duration was 9.9 hours. 57.4% of children had an electronic gadget in their bedroom.

Conclusion

Physical inactivity, increased sedentary behaviour and increased food intake were the main contributors of increased BMI in Maltese children during the Coronavirus pandemic. A better balance of home-schooling hours, physical activity and nutrition should be advocated as a strategy to prevent childhood obesity especially if countries revert/retain home-schooling for the foreseeable future.

Amanda Fenech* MD, MRCPCH(UK), M.Sc. (Melit.)
Department of Paediatrics
Mater Dei Hospital
Msida, Mala
amanda.fenech@gov.mt

Simon Attard Montalto MD, FRCP, FRCPCH, DCH
Universtiy of Malta
Faculty of Medicine and Surgery,
Msida, Malta
Department of Paediatrics
Mater Dei Hospital
Msida, Mala

*Corresponding author

Introduction

The SARS-CoV-2 pandemic has affected all nations worldwide and every aspect of human activity. Nations have been put on forced lockdown, barriers were put up and life as we knew it changed drastically. Malta was not exempt, and the local lockdown mandated that everyone, including children, were required to stay indoors. The educational services and teachers rose to the challenge and provided home-schooling. However, this had major implications on lifestyle change, and an evaluation of the children's health during the Coronavirus pandemic was required. Although schools re-opened in April 2021, many 'vulnerable' children were still not attending. Any information relating to the impact on the general health of the whole paediatric population during lockdown/home-schooling, would be imperative, and upon which any improvements needed if Malta is constrained revert to home-schooling becomes the 'norm'.

Children's physical health can be subdivided into four domains: physical activity, sedentary behaviour, nutrition and sleep. All are very important in maintaining a healthy lifestyle.

Physical activity (PA) is defined as bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level and can involve anything from daily household chores to structured exercise and sport.[1] The World Health Organization (WHO) have published global recommendations on PA for health,[2] stating that children between 5 and 17 years should accumulate at least 60 minutes of moderate-to-vigorous physical activity (MVPA) daily in multiple short bouts. Despite this, the 2013/2014 Health Behaviour in School Children (HBSC) Study,[3] showed that not even a quarter of Maltese children achieved the recommended 60 minutes of MVPA a day, girls were less active than boys, and MVPA decreased with increasing age.

Sedentary behaviour, such as playing video games, watching television and browsing the internet, are widely linked to obesity in children.[4–7] Conversely, being physically active, protects from developing weight problems,[8] reduces the risk of chronic disease, enhances academic performance, cognitive function, self-esteem and body image.[9] In fact, physical inactivity is identified by WHO as the fourth risk factor of global mortality.[10] WHO, the American Academy of Paediatrics (AAP) and the Centres for Disease Control and Prevention (CDC) all recommend that sedentary screen time should be no more than 1 hour a day.[11-12]

Fruits and vegetables are widely accepted as important components of a healthy diet. Reduced consumption of fruit and vegetables is linked to poor health and increased risk of non-communicable diseases including cancers, obesity, diabetes and cardiovascular diseases.[13] WHO/FAO published a report in 2004 recommending a minimum of 5 portions (400g) of daily fruit and vegetables.[14]

Sugar-sweetened beverage consumption is elevated worldwide and contributes to the overall energy density of diets in view of the large amounts of sucrose or fructose that these drinks contain.[15] WHO recommends reducing the consumption of free sugars to less than ten percent of the total energy intake.[16]

Sleep is an important, often neglected, aspect in children's physical health. Inadequate or poor quality sleep during childhood affects the developing brain's emotional and cognitive functions and increases the risk of obesity.[17]

Consensus recommendations from AAP and the American Academy of Sleep Medicine (AASM) advise on age-dependent sleeping hours.[18] Technology gadgets in the bedroom during early childhood have been associated with decreased sleep.[19]

Growth is the best indicator of health and can be assessed accurately using established anthropometric measurements. It has been extensively applied to the valuation of health and nutritional risk, especially in children.[20]

The objective of this cross-sectional survey was to assess children's physical health status within various domains, during a pandemic-driven lockdown situation resulting in home-schooling to implement informed and adequate planning for future needs.

Materials and Methods

Participants

Participants were recruited by posting the link to the Google Forms questionnaire on various local parent groups on Facebook, the Maltese Paediatric Association Facebook group, as well as on individual paediatric doctors' Facebook platforms. The target participants were the parents and carers of children living in Malta under the age of 16 years of age. They were invited to fill in the five-minute questionnaire on a voluntary basis and anonymously. All responses were included unless the discrepancy between the child's age, height and weight input was such that an error was likely (e.g., a 10-year-old boy reported to weigh 12 kg, or a 9-year-old girl with a height of 1m).

Questionnaire details

A self-administered, 7-day recall questionnaire was formulated to aid parents in their recollections of children's activities. The questionnaire contained five subsections that included questions on physical activity, sedentary behaviour, nutrition and preferred beverage, anthropometric measurements and sleep. The majority of the questions were tick-based on Likert-like scales for increased compliance. Each question/section had to be answered before proceeding to the next section and final submission. Parents were asked to input the age, height and weight of their children. Parental perception of children's weight status and comparisons of food intake, physical activity and body mass were linked to their children's pre-pandemic status. Responses were collected over 7 consecutive days in June 2020, after 3 months of a national-imposed lockdown and change to home-schooling. For all participants, BMI z-score was calculated using the AnthroPlus software (v1.0.4),[21] using measurements provided by the parents. The study protocol was approved by the local university's Research Ethics Committee. The full questionnaire can be found at: https://docs.google.com/forms/d/e/1FAIpQLSc6qYD7_q1iCsjxvuHViF8UB3J504fRND9soOzoZBVwy9EomQ/viewform.

Age groups

Since the age range for participants varied between 1 year and 15 years, the children were further subdivided into groups including Pre-Primary school age for 1 to 5 years, Primary school age for 6 to 11 years, and Secondary school age from 12 to 15 years.

Weight status

Obesity status in the children was defined using 2007 WHO child growth reference charts of BMI-for-age for 5-19 years.[22-23] Overweight was defined as a BMI z-score greater than +1, whereas obesity was defined as a BMI z-score greater than +2.

Statistical procedures

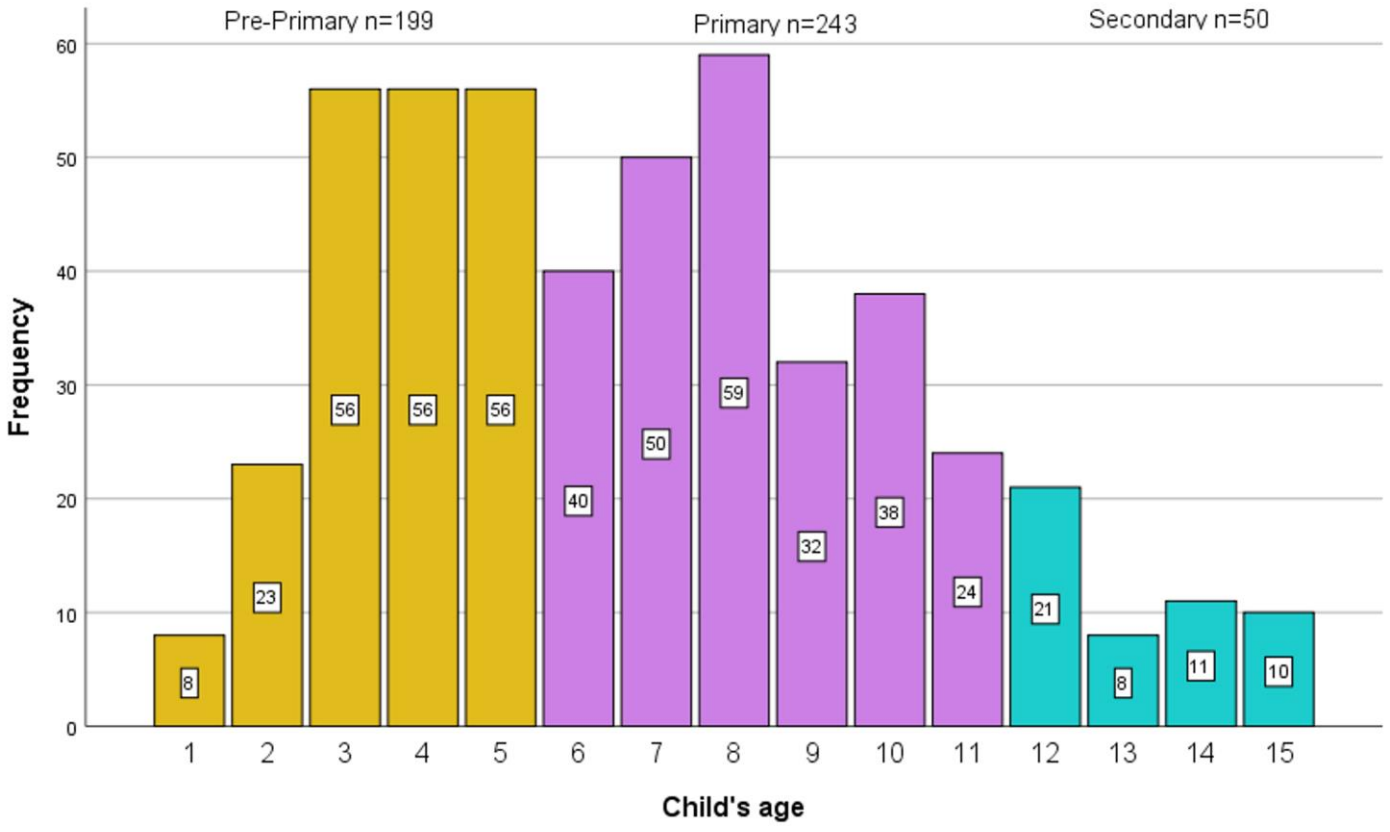
Questionnaire responses were analysed with IBM SPSS v25, 64-bit edition for Windows (SPSS Inc., Chicago, IL). Analysis included descriptive statistics for frequency of variables and examination of multiple responses. Parametric comparison of means was used to compare metric data between groups. Chi-square test confirmed significant discrepancies between parents' perception of their children's weight and their actual weight status, whereas one-way ANOVA were used to analyse relationships between categorical variables such as the average sleep duration and the child's weight status and the average MVPA achieved and child's weight status.

RESULTS

Descriptive

A total of 521 responses were collected. However, 29 were excluded from the study due to clear errors relating to data input in the children's height, weight or age. 492 responses were included, of which 262 were boys (53%) and 230 were girls (47%). The age range of the children varied between 1 and 15 years. These were then subdivided into Pre-Primary (1-5 years), Primary (6-11 years) and Secondary school-age children (12-15 years) (Figure 1).

Figure 1 Descriptive representation of the children's age taking part in the questionnaire. Mean =6.87y, SD=3.324, *n*=492



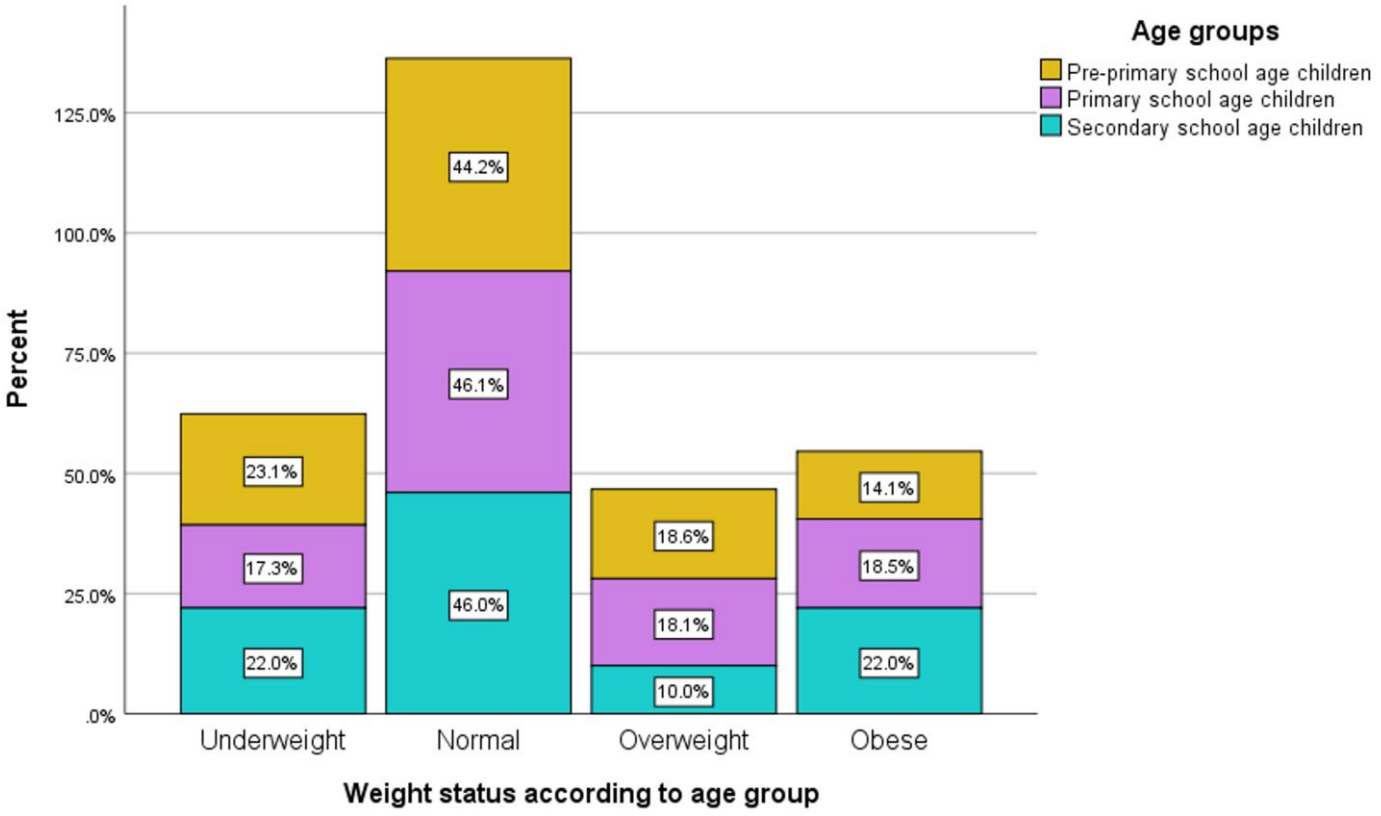
Children's body mass index (BMI)

The BMI z-scores for the children in this questionnaire were calculated based on the weight and height provided by the parents, together with gender and age. The mean BMI z-score was 0.37 (SD=1.719). 45% of children had a normal weight, a total of 35% were overweight (18%) or obese (17%) and 20% were underweight (Figure 2). No significant difference between weight status and gender (p=0.966) was noted.

40% of parents claimed that their children's weight was between 1-2kg lower at the start of the pandemic, 8% claimed their children's weight was 3-5kg lower, whereas 46% claimed it remained the same. Overweight or obesity was mostly observed in children aged between 3 and 8 years of age (67%), with Secondary school children making up 9% of the overweight or obese cohort.

A comparison was made between the actual weight status of the children and the parents' perception of their children's weight: 86% of parents perceived their child's weight as acceptable, and only 9% thought their children were overweight or obese. Chi-square testing confirmed significant discrepancies between parents' perception of their children's weight and their actual weight status ($\chi^2(6) = 115.78$, p<0.001). Less than a quarter of parents whose children were overweight or obese, correctly identified them as such.

Figure 2 Figure showing weight status according to age groups



Physical activity

During the study period, the average number of days during which 60 minutes of moderate-to-vigorous physical activity (MVPA) was achieved was 3.64 days out of 7 (Figure 3a and Table 1). Only 18% of boys and 15% of girls (17% of the total number of children), managed to achieve a daily MVPA of 1 hour during the previous week. Boys were, on average, slightly more active than girls (3.71 days *vs* 3.56 days per week), but the difference was not significant (p=0.407).

There was a decrease in the daily achievement of 60 minutes of MVPA during the pandemic when compared to the lifestyle before the pandemic. Parents reported a higher MVPA activity before the lockdown, with 21% achieving 1-hour MVPA daily *vs* 17% after lockdown. Moreover, prior to the pandemic, 54% of children were able to achieve the daily recommended MVPA at least 5 days a week or more (Figure 3b), but this decreased to 32% during the pandemic (Figure 3a).

Figure 3A Number of days in which children achieved >60 minutes of MVPA over the previous week during the Coronavirus pandemic

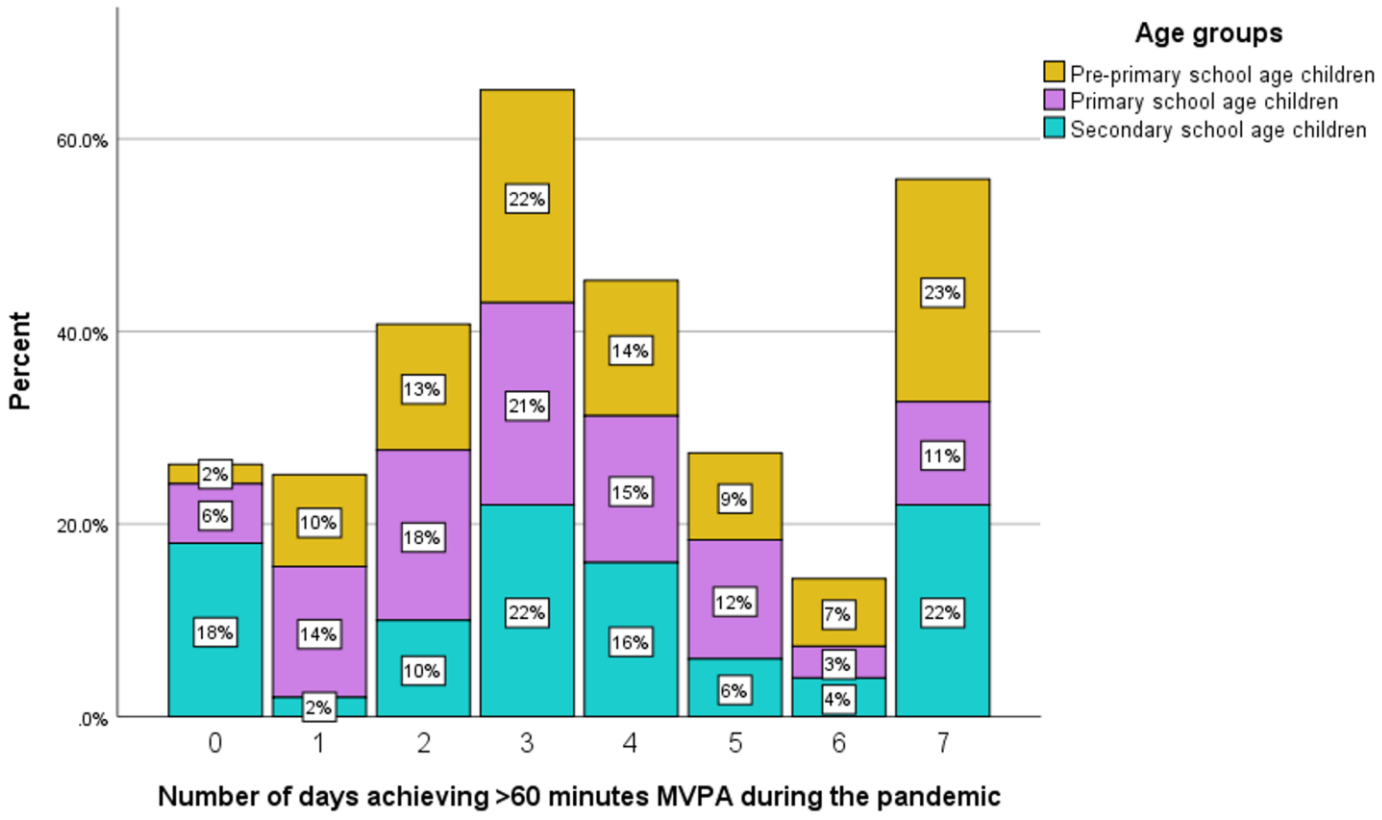
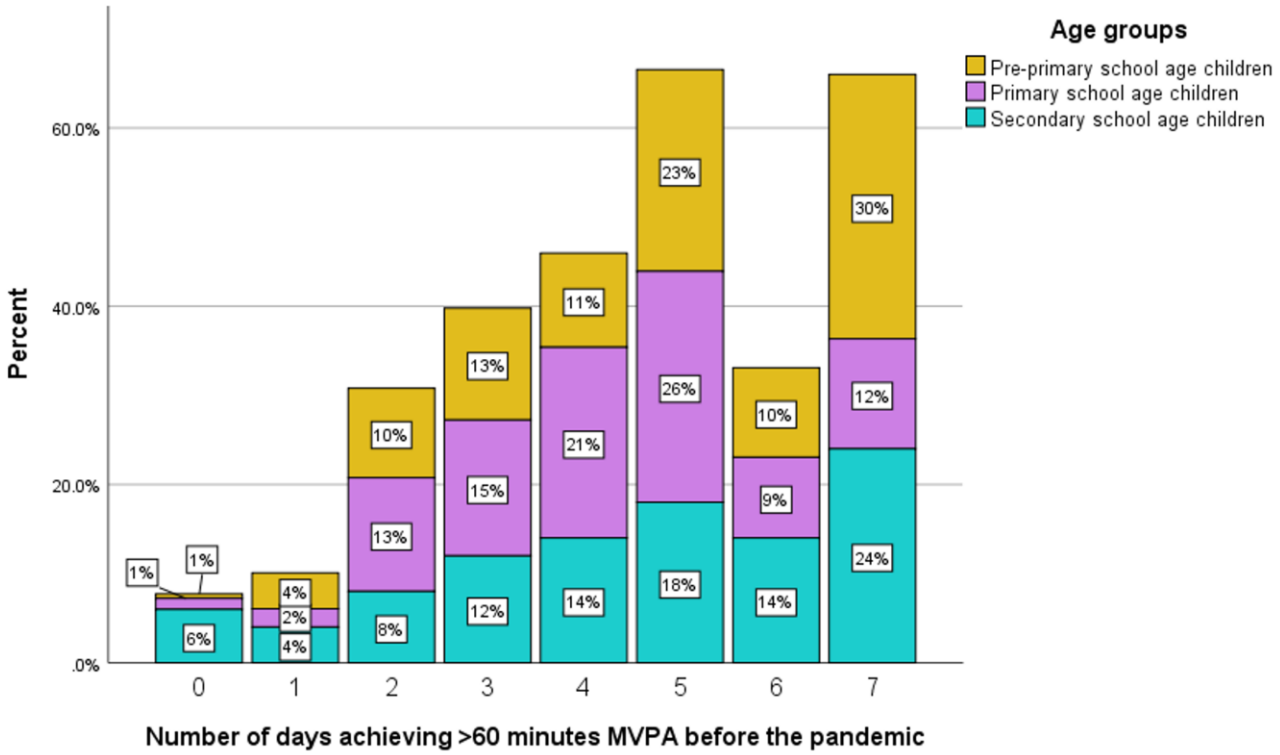


Table 1 Daily MVPA, hours of home-schooling, hours in sedentary activities, fruit and vegetable portions, sleep and number of gadgets in the bedroom for different age cohorts.

	Pre-primary school age (1-5 years)	Primary school age (6-11 years)	Secondary school age (12-15 years)
N	199	243	50
1-hour MVPA (days out of 7)	4.08 (2.096)	3.29 (1.965)	3.60 (2.416)
Home-school (hours)	1.48 (1.424)	3.25 (1.371)	3.64 (1.549)
Sedentary activities (hours)	3.61 (1.844)	4.46 (1.803)	5.14 (2.222)
Vegetable portions	1.91 (1.422)	1.93 (1.565)	2.40 (1.591)
Fruit portions	2.44 (1.416)	2.09 (1.386)	2.24 (1.403)
Sleep duration (hours)	10.17 (1.017)	9.88 (1.000)	9.20 (1.067)
TV (% use before bed)	19 (39.0)	23 (0.425)	30 (0.463)
Mobile phone (% use before bed)	2 (14.11)	16 (37.2)	66 (47.9)
Tablet (% use before bed)	18 (38.2)	24 (42.7)	14 (35.1)
Computer or laptop (% use before bed)	2 (14.1)	11 (31.0)	44 (50.1)
Video game consoles (% use before bed)	1 (10.0)	9 (28.2)	26 (44.3)

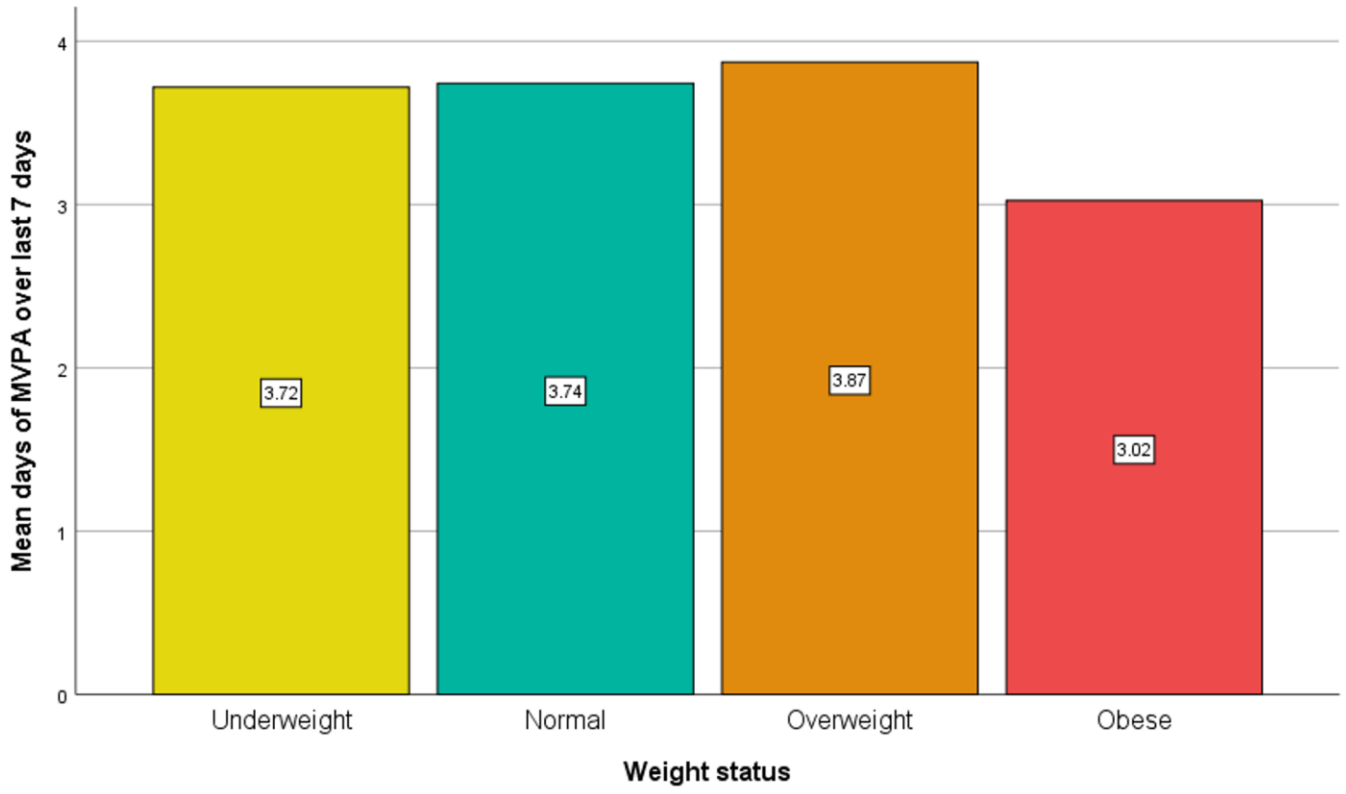
Number within brackets shows the standard deviation of the variable. MVPA = moderate-to-vigorous physical activity.

Figure 3B Number of days in which children achieved >60 minutes of MVPA before the pandemic



The most common PA performed during the lockdown was walking (48%), closely followed by running (45%), swimming (30%), home exercises (27%), cycling (24%) and dancing (22%). When PA was assessed according to weight status, it was noted that obese children, with a BMI z-score of over 2, were the least active. The study reported that obese children were active 3.0 days out of 7.0 days, overweight children were active 3.9/7.0 days and normal and underweight children were reported to be active for 3.7/7.0 days (Figure 4). The differences between group means were statistically significant ($F(3,488) = 3.050$, $p=0.028$). For the whole group, one hour of MVPA was only achieved in 3.64 days (SD=2.096) out of 7. Post hoc comparisons using the Bonferroni test indicated that the mean score for weekly MVPA in the obese group (Mean(M)=3.02, Standard Deviation (SD)=2.16), was significantly less than the weekly score for the overweight group (M=3.87, SD=2.00, standard error of the mean (SEM)=0.32, $p=0.049$, and normal group (M=3.74, SD=2.07, SEM=0.26, $p=0.034$.). Of those children who managed to be active for an hour a day, 60% had normal weight, 11% were underweight, 17% were overweight and 12% were obese ($p<0.001$).

Figure 4 Mean days of MVPA per week according to weight status



Sedentary behaviour

i. Home-schooling

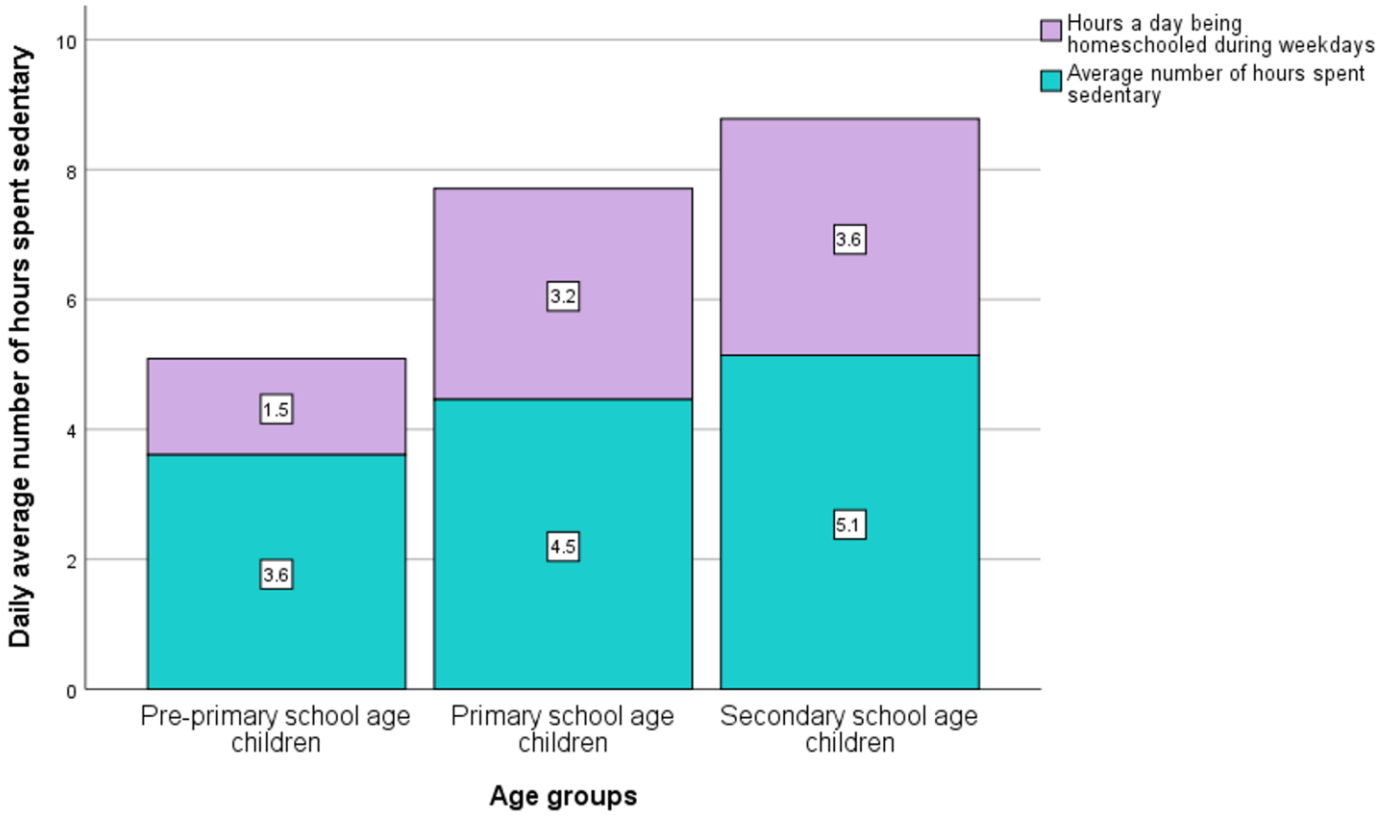
The mean number of hours of daily home-schooling was 2.57 hours (SD=1.675 hrs) (Table 1). Just 13% of children had an average of 4 hours of home-schooling during the weekdays, and 18.9% of children (n=93) received 5 hours or more, the majority in the junior years of primary school (Years 1-3).

ii. Sedentary activities

In addition to the number of sedentary hours spent on home-schooling, during the Coronavirus pandemic children also spent a significant amount of their leisure-time undertaking sedentary activities (Figure 5).

Almost 95% of children in this cohort spent at least 2 hours or more doing various activities sitting down (Table 1). Moreover, 70% of parents confirmed that their children were more sedentary during the pandemic when compared to their 'normal', pre-pandemic lifestyle. Furthermore, obese children had a significantly increased daily mean of 4.68 of sedentary hours, compared with 4.27 hours in overweight children, 4.07 hours in those with a normal weight, and 3.79 hours in underweight children ($F(3, 488) = 2.792$, $p=0.040$).

Figure 5 Daily average number of hours children spent sedentary during home-schooling and leisure activities.



Children's nutrition

i. Fruit and vegetables

The mean number of daily portions was 1.97 portions (SD: 1.515) for vegetables and 2.24 (SD: 1.403) for fruit, for a total of 4.21 portions (out of 5) (Table 1). 18% of children did not take vegetables regularly, whereas only 9% of children did not take regular fruit portions. There was no association between the intake of fruit and vegetables with weight status (p=0.359 and p=0.510, respectively), gender (p=0.262 and p=0.579), and age (p=0.219 and p=0.569).

ii. Beverages

The preferred beverage was water (94%), followed by milk (34%). Sugary drinks such as juice, iced tea and soft drinks were the preferred beverage amongst 14% of children but, in this study, this was not statically associated with the child's weight (p>0.05).

iii. Meals and snacks

Over 88% of children ate three main meals during the pandemic, with lunch being the most popular (93%). In addition, more than half the children ate two snacks a day.

83% of parents claimed that the previous day's food intake was the usual amount their children were eating during the pandemic. Furthermore, 27% of parents noted that their children were eating more food during the pandemic than they usually ate pre-pandemic.

Sleep

The mean number of hours of sleep within this cohort of children was 9 hours 56 minutes (SD: 0.04), but this did not alter significantly when comparing with reported pre-pandemic sleep patterns ($F(3,488) = 0.565$, p=0.613) (Table 1).

A majority of children (57%) had an electronic gadget in their bedroom, but there was no link with the child's weight status. The most common was a TV (17%), followed by a tablet/iPad (15%), and a mobile phone (12%).

Discussion

Despite having more free time at their disposal, children in this study cohort spent less time doing adequate physical activity (PA) during the pandemic-associated lockdown. Only 17% of the children in this cohort achieved the daily MVPA recommendations. This can be noted from the parents' pre-lockdown PA report in which 21% of children achieved the daily MVPA recommendations. These figures tally with the latest HBSC Study carried out in 2013/2014 in Malta, which showed that only 21% of 11-year-old girls and 28% of 11-year-old boys achieved the recommended hour of MVPA a day. In this group, girls were less active than boys and MVPA decreased with increasing age (WHO, 2016).

In 2014, the HBSC study also reported alarmingly high figures of daily television-watching of two hours or more during weekdays (sedentary behaviour) amongst Maltese youths, including 50% in 11-to-15-year-old girls and 58% in boys. Although alarming, these rates are relatively small compared to those found in this study with 96% of 11-to-15-year-old Maltese girls and 93% of boys spending more than 2 hours of daily screen time during the lockdown period.

Home-schooling, regardless of any pandemic, has become increasingly popular. Despite home schooling not having any legal basis in many countries, the total number of home schooled children in the world at the beginning of 2020 was still under three million, constituting 6% of school-age children.[24] A

number of publications have analysed home-schooling with body composition, PA and cardiovascular risk and have already established a decrease in unstructured PA, an increase in anthropometric measurements and increased cardiovascular risk in home-schooled children. [25-26] This study has supported these findings since BMI z-scores increased, there was a reduction in overall PA and an alarming increase in sedentary activities outside from the actual hours spent being home-schooled.

Maltese children preferred to eat fruit slightly more than vegetables, and during the lockdown, children have been shown to have increased their intake of fruit and vegetables,[3,27] although not to recommended amounts. On average, the intake was around 84% of the recommended five portions of fruit and vegetables a day. This could be the result of an increased availability of fruit and vegetables at home during the lockdown.

The preferred beverage of Maltese children was water (94%) with only 14% who reported a preference for sugar-sweetened beverages in addition to water. This was a positive improvement from the data portrayed in Food and Nutrition policy and action plan for Malta in 2015 [28] that reported an average of 44% of youths admitting to drinking sugar-sweetened beverages on a daily basis. A potential reason for this was the enforced relocation of food and beverage consumption to home rather than from restaurants or take-aways.

Most Maltese children ate their three main meals every day in addition to two further snacks. More than a quarter of parents noted that their children were eating more food during lockdown, perhaps because of the immediate availability of food throughout the day. Eating out of boredom could also attribute to being stuck at home during the lockdown.

In this study, 33% of pre-Primary school children, 36.6% of Primary school children and 32% of Secondary school children were overweight or obese. The figures were somewhat less than those reported by Grech and colleagues within the national BMI study in 2017, who found that 40% of primary schoolchildren and 43% of secondary schoolchildren were overweight or obese.[29] A potential reason for this was the under-representation (10%) of secondary school-age children in this study. The figures in this study are likely to be underestimates and, indeed, the pandemic has had a negative impact on children's weight and, in this study, 40% and 8% of parents claimed that their children's weight was between 1-3kg and 3-5kg lower three months before the pandemic, respectively.

The pandemic has forced almost all extra-curricular activities and social occasions to be suspended. This had a positive effect on children's sleep, and most children achieved the appropriate hours of sleep as recommended by the AAP and AASM.[18] To-date, there have been no previous studies carried on the amount of sleep in Maltese children, hence comparisons to pre-pandemic times were not possible. However, although electronic gadgets negatively influence the quality and duration of sleep, the high proportion (57%) of Maltese children who had tablets, laptops, video games, mobile phones or a TV in their bedroom was cause for concern.

Limitations

This study was a retrospective and not case-controlled study. Furthermore, it was not population representative, since it was

dependent on reporting only by those individuals who were selected from existing social platforms, were able to access the questionnaire and sufficiently motivated to reply. Parents who did not frequent social media platforms would have missed the opportunity to fill in the questionnaire altogether. The percentage response rate, as a reflection of the population at large, could not be calculated. Furthermore, the study included a relatively small number of children and had only two comparative points in time namely during the pandemic and before the pandemic. Another important limitation to this study was that there was no prior validation of the questionnaire, and a pilot study was not carried out. Moreover, collection of the study data was dependent on parents inputting the height and weight of their children correctly, and any subject to inherent error and subjective bias. A number of data entries (*n*=29) were selectively excluded from the analysis due to 'unlikeliness/impossibility' of the anthropometric measurements provided vis-à-vis the child's age (for example, a 9-year-old girl whose height was reported as 1m). Results may have been skewed, however, Z-scores were not used to exclude such errors so that subjects at the extreme tail ends of the distribution curve, were not automatically removed. Furthermore, there was an under-representation of secondary school-age children (only 10% of the participants), a group already known to have some of the greatest obesity-related problems in the country.

Despite the numerous limitations, the study was able to show definite trends in children's health that were caused by the SARS-CoV-2 pandemic. This included several positive developments, including the increase in the duration of sleep in all age groups and increased fruit and vegetable intake. On the downside, these were outweighed with worrying trends showing an overall increase in food intake, an increase in children's BMI as a result of decreased daily MVPA activity, and an increase in sedentary activity during the period of home-schooling.

Conclusion

Childhood obesity is a severe, global nutritional problem, and Malta has the highest percentage of 11, 13 and 15-year-old children who are overweight and obese. The Coronavirus pandemic has imposed home-schooling on most children worldwide, including Malta. In this study, the lockdown did not negatively impact children's sleep patterns and may have promoted an increase in fruit and vegetable intake although not to recommended amounts. However, this study also showed that enforced lockdown resulted in increased weight gain in Maltese children, probably contributed to by decreased levels of MVPA, increase in sedentary behaviour, and increased food intake. Future planning of children's education in Malta, including both structured and unstructured PA in school or at home, must include this important public health issue within the curriculum, as part of a National strategy to fight against childhood obesity.

Acknowledgments

I am grateful to all parents who took the time to fill in the questionnaire.

Summary Box

What is already known?

- Childhood obesity is a worldwide epidemic with very high rates found in Malta.
- The Health Behaviour in School Children (HBSC) Study carried out in 2013/2014, showed that only 21% of adolescent Maltese girls and 28% of adolescent boys achieved the recommended hour of MVPA a day.
- The same HBSC study also reported alarmingly high figures of daily television-watching of two hours or more during weekdays (sedentary behaviour) amongst Maltese youths, with 50% in 11-to-15-year-old girls and 58% in boys.

New findings from this study

- The lockdown had a positive impact on amount of sleep, decreased sugar-sweetened beverage intake and increased fruit and vegetable consumption in Maltese children.
- Less children (17%) achieved the recommended 60 minutes of MVPA during the lockdown and obese children were found to be significantly less active.
- Over 95% of children spent an additional 2 hours or more in sedentary activities (excluding home-schooling).
- Increased food intake and rising prevalence of overweight and obesity in children were observed.

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ORIGINAL ARTICLE

Allele frequencies of Human Platelet Antigen 1 and Human Platelet Antigen 5 in the Maltese

Martina Falzon Lia, Sarah Samut Tagliaferro, Rosienne Farrugia

Background

The human platelet antigen systems consist of antigenic polymorphisms that arise from single base pair substitutions leading to amino acid changes in platelet glycoproteins. These polymorphisms cause a variety of clinically significant conditions where platelet typing is essential for accurate diagnosis and subsequent treatment. The aim of this study was to determine the allele frequencies of Human Platelet Antigen-1 (HPA-1) and Human Platelet Antigen-5 (HPA-5) in the Maltese population and to compare these frequencies to those in other populations.

Methods

This study was conducted on a total of 508 population DNA samples. Polymerase chain reaction was used to amplify segments of DNA spanning the single nucleotide polymorphism of interest for both the HPA-1 and HPA-5 systems. A restriction enzyme digest was then used to differentiate between the genotypes. The data was analysed by gender and nationality.

Results and Conclusion

From this study it was determined that, for these two polymorphisms, the Maltese population is in Hardy-Weinberg equilibrium and that the local allele frequencies are similar to frequencies of geographically close populations. The frequencies of these two HPA systems are: HPA-1a/1a; 71.6%, HPA-1a/1b; 25.5%, HPA-1b/1b; 2.9%, HPA-5a/5a; 77.4%, HPA-5a/5b; 22.0% and HPA-5b/5b; 0.6%.

Martina Falzon Lia* M.D , B.Sc. (Hons)
Department of Applied Biomedical Sciences,
Faculty of Health Sciences,
University of Malta
Msida, Malta
mfalzonlia.92@gmail.com

Sarah Samut Tagliaferro MSc.
Department of Applied Biomedical Sciences,
Faculty of Health Sciences,
University of Malta
Msida, Malta

Rosienne Farrugia PhD
Department of Applied Biomedical Sciences,
Faculty of Health Sciences,
University of Malta
Msida, Malta
Centre for Molecular Medicine and Biobanking,
University of Malta
Msida, Malta

*Corresponding author

INTRODUCTION

Platelet glycoprotein genes are polymorphic and these give rise to the platelet surface antigens which make up the Human Platelet Antigen (HPA) system. Twenty-nine HPA systems on 6 different glycoprotein complexes have been identified until now.[1] The HPA system is an immunogenic system of alloantigens which, in the case of alloimmunization, may lead to a number of clinically significant conditions. Most HPA systems are biallelic including a high frequency antigen termed as 'a' and a lower frequency antigen termed as 'b'.[2] The HPA-5 polymorphism is situated in the GPIa part of the glycoprotein GPIaIIa,[3] a collagen receptor on the surface of platelet membranes. It is caused by a single nucleotide polymorphism (SNP) on the gene that codes for the GPIa; the *ITGA2* gene.[4] The polymorphism causes a single base change of Guanine into Adenine, which leads to an amino acid change of Glutamic acid to Lysine located between the first and second divalent cation binding domain of the GPIa.[5] On the other hand, the HPA-1 polymorphism is located on platelet GPIIa at amino acid residue 33.[6] The Leucine (HPA-1a) to Proline (HPA-1b) SNP is positioned in exon 3 of the *ITGB3* gene.[7]

Alloimmunization against such antigens can lead to 3 main clinical conditions which include Foetal and Neonatal Alloimmune Thrombocytopenia (FNAIT), Post Transfusion Purpura (PTP) and Refractoriness to Platelet Transfusion (RTP). Other conditions such as drug-induced and transplant-associated thrombocytopenia have also been reportedly associated.[1] Recent studies have shown the association between some HPA systems and Hepatitis C virus (HCV) infection. HCV not only invades hepatocytes but also numerous other types of cells including B-cells and T-cells,[8] macrophages and monocytes[9] and platelets.[10] Studies have also shown the relevance and possible association of HPA-5b and HCV carriers, where a higher allele frequency of HPA-5b was present in HCV carriers.[11]

FNAIT is a rare condition, with an incidence rate of 1 in 1000 to 1 in 2000 live births. [12-15] The condition is characterised by either severe thrombocytopenia in a newborn at birth or 7 days after birth, with a platelet count falling below 100,000 X 10^9/L, or foetal intracranial haemorrhage (ICH) with no other cause.[16] FNAIT occurs during pregnancy when the maternal immune system detects foetal platelet specific antigens that are different from those present in the mother and in turn produces immunoglobulin G antibodies against these platelet antigens. These antibodies target and destroy foetal platelets,[17] resulting in extravascular lysis of platelets[18] and reduced production[19]. The most common HPA to cause FNAIT is alloimmunisation against HPA-1a[12] causing 75 % of FNAIT cases followed by alloimmunisation to HPA-5b[20] causing 16 % of all FNAIT cases.

PTP is an immuno-haematological disorder that may be observed in patients a week or several weeks after being transfused with a blood product containing platelets or platelet membranes.[21] It has been reported in 1:50,000-100,000 transfusions[22] and results in widespread purpura associated with fever, chills and bronchospasms around 7 - 10 days after receiving the transfusion. In general, such patients would have already been exposed to allogeneic platelets either through pregnancy or previous blood transfusions. The alloimmunisation causes the destruction of both the foreign alloantigenic platelets as well as the patient's own platelets resulting in a

severe thrombocytopenia. RTP is a similar but milder condition where a low platelet count is noted after the patient has received an allogeneic random donor platelet transfusion.[21]

The population frequency of the HPA polymorphisms in the Maltese population are unknown and determining their frequencies would be useful for better detection, prevention and prompt treatment of all conditions described above, including identifying those who may be at risk to developing PTP and RTP.

MATERIALS AND METHODS

A total of 508 sequential cord blood samples were obtained from an anonymised Cord Blood Bank collection maintained by the Laboratory of Molecular Genetics (ethical approval 48/2002) and consisted of all samples from those born over a 2-month period in 2010. The only demographic data available included gender and whether the parents were Maltese or foreign. DNA was extracted from these samples using the Salting out technique.[23] The quantity of the DNA was measured using the Nanodrop 2000c spectrophotometer and the DNA integrity was checked by agarose gel electrophoresis using a 0.7 % agarose gel. Each DNA sample was diluted to a concentration of 50 ng/µL.

In order to amplify the HPA-1 and the HPA-5 gene fragments of 193 bp and 256 bp respectively (Figure 1), specific primers were selected and polymerase chain reaction (PCR) was optimised (Table 1). The restriction enzyme *Nci*I (NEB, UK) was used to digest HPA-1 PCR products (Figure 2A) using specific primers[24]. For HPA-5, the reverse primer had an altered nucleotide (A to T) 3 nucleotides from the 3' end, in order to create a restriction enzyme cutting site for restriction enzyme *Dde*I[25]. The restriction enzyme *Dde*I (NEB, UK) cuts only HPA-5a PCR products but not HPA-5b PCR products (Figure 2B). The restriction enzyme digest products were separated by agarose gel electrophoresis and genotypes called based on the fragment pattern.

Statistical analysis included the calculation of allele and genotype frequencies for the Maltese population, as well as the χ^2 test to determine if these were in Hardy-Weinberg equilibrium (HWE). Allele and genotype frequencies were calculated for the entire cord DNA collection as well as the subgroup with 2 Maltese parents. The 'difference between 2 population proportions' calculation was used to determine if there were any differences between frequencies of the subgroup with 2 Maltese parents (representing the traditional Maltese gene pool) and the collection as a whole (representing the current Maltese gene pool).

Figure 1 *PCR products of HPA-1 and HPA-5.* **(A)** HPA-1: Lane 1 represents the 100 bp DNA ladder. Lane 2 - 8 are 193 bp PCR products of HPA-1 and Lane 9 is the negative control. **(B)** HPA-5: Lane 1 represents the 100 bp DNA ladder. Lanes 2 - 5 are 256 bp PCR products of HPA-5. Lane 6 is empty and Lane 7 is the negative control.

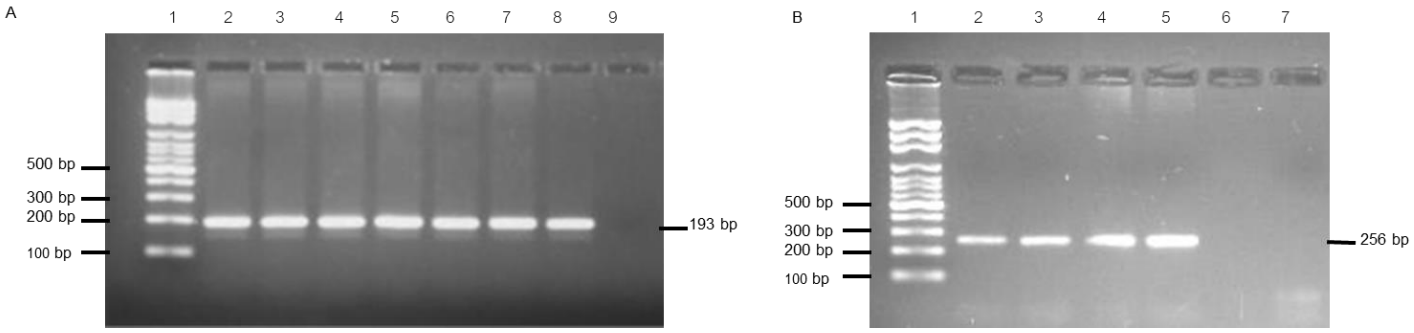

Table 1 **Primer sequences and PCR annealing temperature for HPA-1 and HPA-5.** The nucleotide highlighted in bold and underlined is the mismatched nucleotide used to create a DdeI restriction enzyme site.

	Primer Sequence		PCR Product (bp)	Annealing Temperature (°C)
HPA-1	**F**	**5'** TCTTTGGGCTCCTGACTTAC **3'**	193	52
	R	**5'** CTGGGGACTGACTTGAGTGA **3'**		
HPA-5	**F**	**5'** CTCTCATGGAAAATGGCAGTA **3'**	256	50
	R	**5'** AGGAAGAGTCTACCTGTTTACTATC**T**AA **3'**		

F=forward primer; R=reverse primer; bp=base pairs

RESULTS

A total of 508 samples were tested to represent the Maltese population and these consisted of 51 % males and 49 % females. The HPA-1 and HPA-5 gene fragments were successfully amplified by PCR for these samples (Figure 1) and genotyped using *Nci*I and *Dde*I respectively (Figure 2).

Genotype frequencies were calculated for each polymorphism (Table2) and found to be in HWE using the Chi-squared test. The allele frequencies were determined as follows: 0.844 for HPA-1a, 0.156 for HPA-1b, 0.884 for HPA-5a and 0.116 for HPA-5b. From the genotype frequencies, the allele frequencies were calculated and compared to frequencies of other worldwide populations[26-36] (Table 3). Statistical analysis using the χ^2 test confirmed that there is no statistically significant difference between allele frequencies in Malta and the other countries for which data is available.

Figure 2 *Restriction enzyme digest for HPA-1 and HPA-5.* **(A)** *Nci*I digests the HPA-1 PCR fragment of 193 bp when the C nucleotide is present in the HPA-1b polymorphism. This results in fragmentation into a 33 bp and 160 bp fragment. The top panel shows a typical gel and the bottom panel shows a restriction map. In the gel, Lane 1 shows the 100 bp DNA ladder, Lanes 2, 3, 5-9, 11-14, 16 show HPA-1a homozygous samples with an intact 193 bp PCR fragment, Lane 4 is a HPA-1b homozygous sample with a 160 bp fragment and a faint 33 bp fragment, and Lanes 10, 15 and 17 show HPA-1a/1b heterozygous samples. **(B)** *Dde*I digests the HPA-5a homozygous PCR fragment of 256bp into 2 fragments of 25bp and 231bp. The top panel shows a typical gel and the bottom panel shows a restriction map. In the gel, Lane 1 is the 100 bp DNA ladder, Lanes 2-4, 6, 8, 9 and 11 show HPA-5a homozygous samples which were cleaved into a 231 bp and a non-visible 25 bp fragment, Lane 7 is a HPA-5a/5b heterozygous sample and Lane 10 is a HPA-5b homozygous sample with an intact 256 bp PCR fragment.

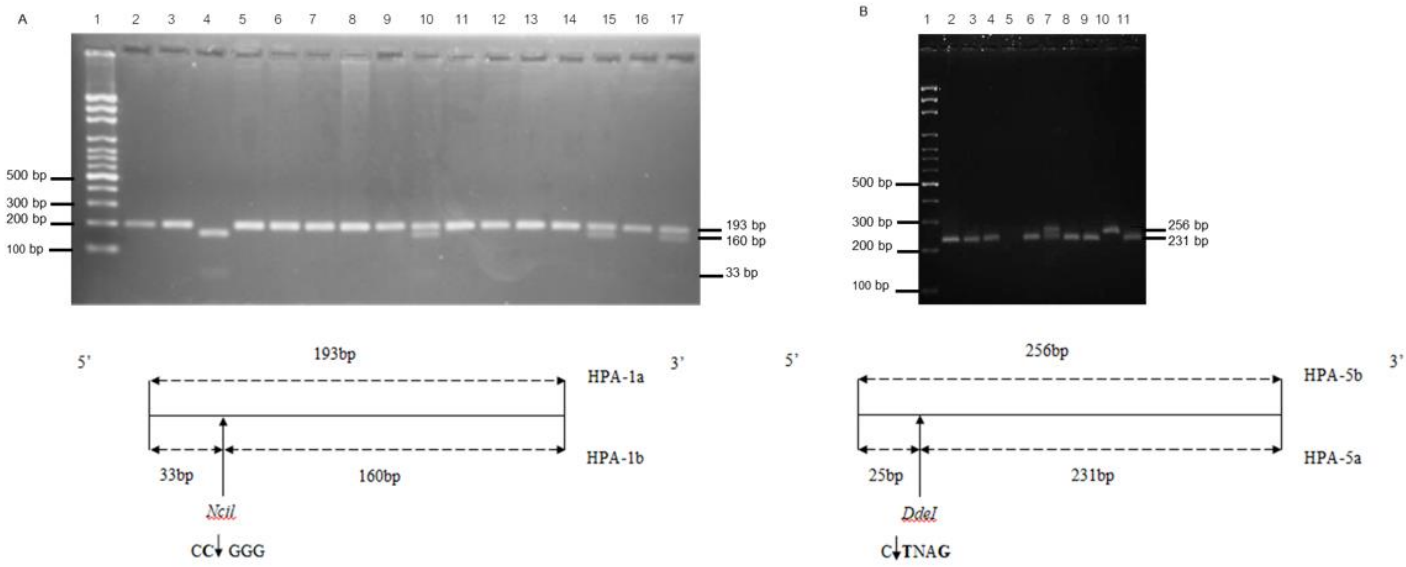

Table 2 **Genotype frequencies of HPA-1 and HPA-5 in the Maltese.** For χ^2 tests p-values > 0.05, the population is in Hardy Weinberg Equilibrium

HPA system	aa genotype (%)	ab genotype (%)	bb genotype (%)	χ^2 test P value
HPA-1	71.6	25.5	2.9	0.486
HPA-5	77.4	22.0	0.6	0.113

Table 3 Allele frequencies for different worldwide populations

Population	Number of samples tested		Allele frequencies			
	HPA-1	HPA-5	HPA-1a	HPA-1b	HPA-5a	HPA-5b
Greek [21]	58	58	0.67	0.33	0.85	0.15
Tunisian [22]	90	90	0.75	0.25	0.78	0.22
Moroccan Berber [23]	110	110	0.75	0.25	0.86	0.14
Slovenian [24]	152	152	0.81	0.19	0.89	0.11
Swiss [25]	500	500	0.81	0.19	0.93	0.07
Spanish [21, 26]	727	454	0.81	0.19	0.88	0.12
Danish [21, 27]	557	427	0.83	0.17	0.92	0.08
German [21, 28]	1583	1643	0.84	0.16	0.92	0.08
Maltese	**489**	**492**	**0.84**	**0.16**	**0.88**	**0.12**
French [21]	800	6192	0.85	0.15	0.87	0.13
Italian [21]	144	144	0.85	0.15	0.90	0.10
Irish [21]	250	250	0.88	0.12	0.91	0.09
African [29]	6382	922	0.89	0.11	0.84	0.16
Congolese [30]	125	125	0.90	0.10	0.73	0.27
Chinese [31]	1000	1000	0.99	0.01	0.99	0.01

DISCUSSION

Genotyping the frequencies of HPA systems is useful in collecting data on the genetics of the population, but may also be useful in clinical scenarios. The allele frequencies of HPA-1 and HPA-5 systems tested in 508 cord blood samples representing the Maltese population were found to be very similar to other Caucasian populations which are geographically close to Malta, such as the Italian, French and German populations (Table 3). When observing the allele frequencies calculated for individuals with one or both parents being foreign, the allele frequencies were also very similar to southern European and northern African populations since most immigrants in Malta originate from these countries.

The incidence rate of FNAIT in several Caucasian populations was found to be 1 in 1000 to 1 in 2000 live births. Last reported data from the National Statistical Office of Malta reported a total of 4444 live births in 2018.[37] Since the HPA-1 and HPA-5 allele frequencies in the Maltese population are similar to other European countries, one should expect to observe approximately 2-3 cases of FNAIT per year. The number of cases of FNAIT in Malta are much lower [Dr. Laspina personal communication]. This low local incidence rate of neonates with FNAIT may be due to several reasons including neonates with FNAIT being born healthy and asymptomatic, or because the HPA incompatibility leads to severe complications such as miscarriages. A similarly low frequency of FNAIT was observed in the Irish population, suggested to be due to under-recognition of the condition.[38]

With the data collected from this study, prospective implementations may be recommended such as donor and patient platelet antigen typing prior to transfusion. Anti-HPA screening is not recommended as this only indicates a possible risk factor for the development of FNAIT and therefore has several ethical issues, including the prediction and management of alloimmunised pregnancies. Post-natal management of FNAIT is therefore more favourable, including setting up genotype screening of newborns showing clinical symptoms requiring transfusion, for appropriate diagnosis and treatment with platelet products. Other possible applications of these findings include using the optimised methods for genotype screening of adults for PTP and RTP, as well as genotyping donor and patient prior to platelet transfusions.[38]

SUMMARY

- Platelets have different surface antigens which make up the Human Platelet Antigen (HPA) system.
- These different glycoproteins on platelet surfaces contribute to different clinical conditions which include FNAIT, PTP and RTP.
- Each country has different allele frequencies for these HPA systems.
- This study was carried out to determine the allele frequency of two of the most common HPA systems, HPA-1 & HPA-5, in the Maltese population.
- PCR and a restriction enzyme digest were used to genotype 508 random DNA samples.
- The local frequencies of these two HPA systems are: HPA-1a/1a; 71.6%, HPA-1a/1b; 25.5%, HPA-1b/1b; 2.9%, HPA-5a/5a; 77.4%, HPA-5a/5b; 22.0% and HPA-5b/5b; 0.6%.

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ORIGINAL ARTICLE

Audit on doctors' documentation of overweight and obesity in children attending general children's outpatient's clinics in Malta

Amanda Fenech, Thea Dimech, Marie Claire Grech, Simon Attard Montalto

Background

Childhood obesity is a global epidemic and Malta is no exception. Despite local awareness, not all children seen at the general hospital's children's outpatients (COP) have their height and weight measured. An audit was carried out on the documentation of overweight and obesity in children, along with any advice given in this regard.

Methods

The NICE guideline on obesity was used to define overweight and obesity. A cross-sectional study was conducted over 10 weeks between January and March 2020. Data on age, gender, weight, height, percentiles/BMI, doctor grade, presenting complaint, appointment frequency and previous anthropometric documentation were collected from clinical notes. All children attending general COP, between 2-15 years of age and free from chronic medical illnesses affecting BMI were included.

Results

In 418 patients, weight and height were documented in 64.8% and 58.1% respectively, while percentiles were documented in 17.0%. Furthermore, BMI was documented in just 1.2% of cases, and in 32% no anthropometric measurements documented whatsoever. Moreover, 29.7% of children who were previously flagged up as obese/overweight were not followed-up, and only 12% who were documented as obese, were investigated, albeit incompletely. Only 7% of known overweight children had dietary advice documented in their notes.

Conclusion

COP's services are not attaining the standard as per current guidelines, which suggest that all children should be screened for obesity opportunistically. We recommend the distribution of a dietary guidelines leaflet to parents, continuous medical education for doctors, giving sustainable advice during follow ups and the introduction of a child obesity clinic.

Amanda Fenech* MD, MRCPCH(UK), M.Sc. (Melit.)
Department of Paediatrics,
Mater Dei Hospital,
Msida, Malta
amanda.fenech@gov.mt

Thea Dimech MD, MRCPCH(UK)
Department of Paediatrics,
Mater Dei Hospital,
Msida, Malta

Marie Claire Grech MD, MRCPCH(UK)
Department of Paediatrics,
Mater Dei Hospital,
Msida, Malta

Simon Attard Montalto MD, FRCP, FRCPCH, DCH
University of Malta,
Faculty of Medicine and Surgery,
Msida, Malta
Department of Paediatrics,
Mater Dei Hospital,
Msida, Malta

*Corresponding author

Introduction

Childhood obesity is a global health problem posing significant public health challenges. This serious health issue has increased alarmingly over the past few decades, with an estimate of over 41 million children over the age of five years being overweight or obese worldwide.[1] Unfortunately, Malta is also similarly affected, as several studies repeatedly demonstrated a high prevalence of childhood overweight and obesity in this country.

In the latest Health Behavior in School Children (HBSC) report, Malta has the highest percentage of overweight and obese children in 11, 13 and 15-year-old youths.[2-3] Consequently, these children are likely to progress into overweight and obese adults, with an increased risk of developing non-communicable diseases such as hypertension, diabetes and other complications at a younger age.[4] Obesity and associated health conditions are preventable with a healthy diet, adequate daily moderate-to-vigorous physical activity and adequate sleep and, therefore, it is of outmost importance to prevent and manage obesity in children. [5-6]

The National Institute for Health and Care Excellence (NICE) has in fact provided clinical guidelines (CG189) for healthcare professionals for best practice advice on the care of adults and children who are overweight or obese.[7] The World Health Organization (WHO) defines overweight as a body mass index (BMI) of ≥85th percentile or a BMI z-score >1, and obesity is defined as a BMI ≥97th percentile or a BMI z-score >2.

The guideline advises to measure a child's height and weight opportunistically and to use BMI, which is adjusted for age and gender, as a practical estimate of adiposity and interpreted within the context of a medical history and pubertal status. Waist circumference is not recommended as a routine measure. If the child's BMI is at or above the 91st centile, tailored clinical intervention should be considered. The guideline advises to stress that obesity is a medical condition with specific health implications rather than how people look because it is important to acknowledge that some families would be unwilling to change their lifestyle and behaviour. NICE's clinical guidance advises that all children with a BMI at or above the 98th centile should be assessed for comorbidities such as hypertension, dyslipidaemia, type 2 diabetes, hyperinsulinaemia, psychosocial dysfunction and exacerbation of conditions such as asthma. Blood pressure measurement, liver profile, fasting blood glucose, oral glucose tolerance test, fasting insulin, endocrine function and HbA1c should be the first line of investigations,[8] and interpreted in the context of the degree of the child's obesity, child's age, history of comorbidities and possible genetic or metabolic causes of overweight or obesity.

Lifestyle factors should be assessed, and this includes physical activity, sedentary behaviour, diet, psychosocial distress and sleep. A family history of being overweight or obese, including associated co-morbidities should be taken, as well as the child and family's willingness and motivation to change lifestyle. In a very small proportion of children, obesity will be the result of endocrine, syndromic or monogenic causes.[9-10] Advice should be given, bearing in mind family dynamics and socio-economic background of the patient for optimal effect. Family-based intervention including dietary modifications and increased physical activity are the cornerstone of weight management in children.[11-12]

Despite the general awareness of the local situation, it was noted that not all children attending the children's outpatient's clinic at Mater Dei Hospital, who are overweight or obese, were not appropriately flagged up. As a result, these children departed from outpatient clinics without proper weight management advice or referral. In fact, childhood obesity was mostly overlooked by doctors, since the main priority during a consultation was the presenting complaint rather than the ongoing chronic process of inadequate energy balance of the child. Moreover, a specialized children obesity clinic was (and remains) not available so far, creating a public health gap despite a dire need for a central place for instituting and coordinating effective obesity management.

The aim of clinicians is to manage children holistically and, therefore, this should include appropriate weight assessment and management. This study was designed to gauge the prevalence of doctors' documentation of overweight and obesity with or without appropriate advice and referral, in the case files of children attending general Children's Outpatients. In addition, this study will provide the opportunity to raise awareness amongst doctors who, in-turn, will be able to provide patient-centered care that is sensitive to the individual's life circumstances and reduce the overall future complication rate in these patients.

METHODS

Ethics

This audit was carried out in Mater Dei Hospital (MDH) and data was collected from patients' files. Permissions from the Chief Executive Officer (CEO) of MDH, Data Protection Officer (DPO), Clinical Consultants in charge of respective clinics and from the Chairman of the Paediatric Department at MDH were obtained. Ethical approval was attained from the University of Malta, Medicine and Surgery Faculty Research Ethics Committee.

Inclusion and exclusion criteria

The list of children covered in this audit included all those children who attended general children's outpatients, between 2nd January 2020 and 16th March 2020. All children between two and fifteen years of age were included in the audit. Children younger than two years of age were excluded since they are assessed with weight for length rather than BMI and thereby could not be classified by using BMI criteria. Moreover, those children suffering from chronic medical illnesses which are uncontrolled, of a metabolic nature that affects BMI or that required use of regular systemic steroids, were also excluded from the audit.

Criterion

The NICE guideline on Obesity: identification, assessment and management (CG189), was used as the criterion to which we compare our local practice.[7]

Data Collection

A longitudinal study design was conducted over a period of ten weeks. Clinical notes of children attending general Children's Outpatient's department between the 2nd January 2020 and 16th March 2020, and meeting the inclusion criteria, were perused. The information collected from the files was inputted on a spreadsheet that was only accessible between researchers. The data was carefully stored and password protected.

The notes were reviewed and analyzed for the documentation of age, gender, weight, height, BMI and height and weight percentiles. Thereafter, if the child was overweight or

obese, documentation of advice given (if any), any referral or further clinical assessment and investigations specifically in view of the increased weight, was noted. The presenting complaint and whether the child suffered from an underlying medical problem associated with obesity was also noted from the clinical notes. This was done to make sure the exclusion criteria were met. Appointment frequency of COP attendance was also collected and whether there were previous anthropometric readings documented. This data was collected to determine the multiple opportunities paediatric clinicians had at their disposal to identify children who were overweight or obese, and provide re-enforcing advice on its' management.

Growth reference charts

The WHO Growth Standards for 0-5 years and the 2007 WHO child growth reference charts for 5-19 years were used for this study.[13-14] Anthroplus software (WHO) was used to convert height, weight, age and gender into BMI-for-age. According to WHO, for children 2 to 19 years of age, the cutoff for overweight body mass index (BMI) is the 85th percentile or above, or a BMI z-score greater than 1, and the cutoff for obese BMI is the 97th percentile or above, or a BMI z-score greater than 2. Normal weight is a BMI between the 2nd percentile to the 84th, or a BMI z-score between -1 to <1. The cutoff for underweight is a BMI below the 2nd percentile, or a BMI z-score below -1.

Statistical analysis

Data analysis was conducted with IBM SPSS v25, 64-bit edition for Windows (SPSS Inc., Chicago, IL). Descriptive statistics were used to detail current prevalence of documented children with overweight or obesity. Independent samples t-test was used to compare means between independent groups. One-way analysis of variance (ANOVA) with Bonferroni adjustment were used to determine whether there are any statistically significant differences between the means of three or more independent groups.

RESULTS

A total of 628 patients had appointments at 45 general Children's Outpatients (COP) clinics between 2nd January and 16th March 2020. 123 (19.6%) patients did not turn up for their appointment, 87 patients were under 2 years of age and hence did not meet the inclusion criteria, and 8 patients were excluded due to chronic/metabolic illness. A total of 418 patients were included in this study. The majority were male (58.1%) and the mean age of the patients was 8.83 years (SD=3.78) (Table 1).

89.2% of the patients attending general COP had Maltese citizenship. The average number of appointments per patient was 7.05 (SD=8.54) appointments, with a median number of 3 appointments. This spanned a period of few months to several years.

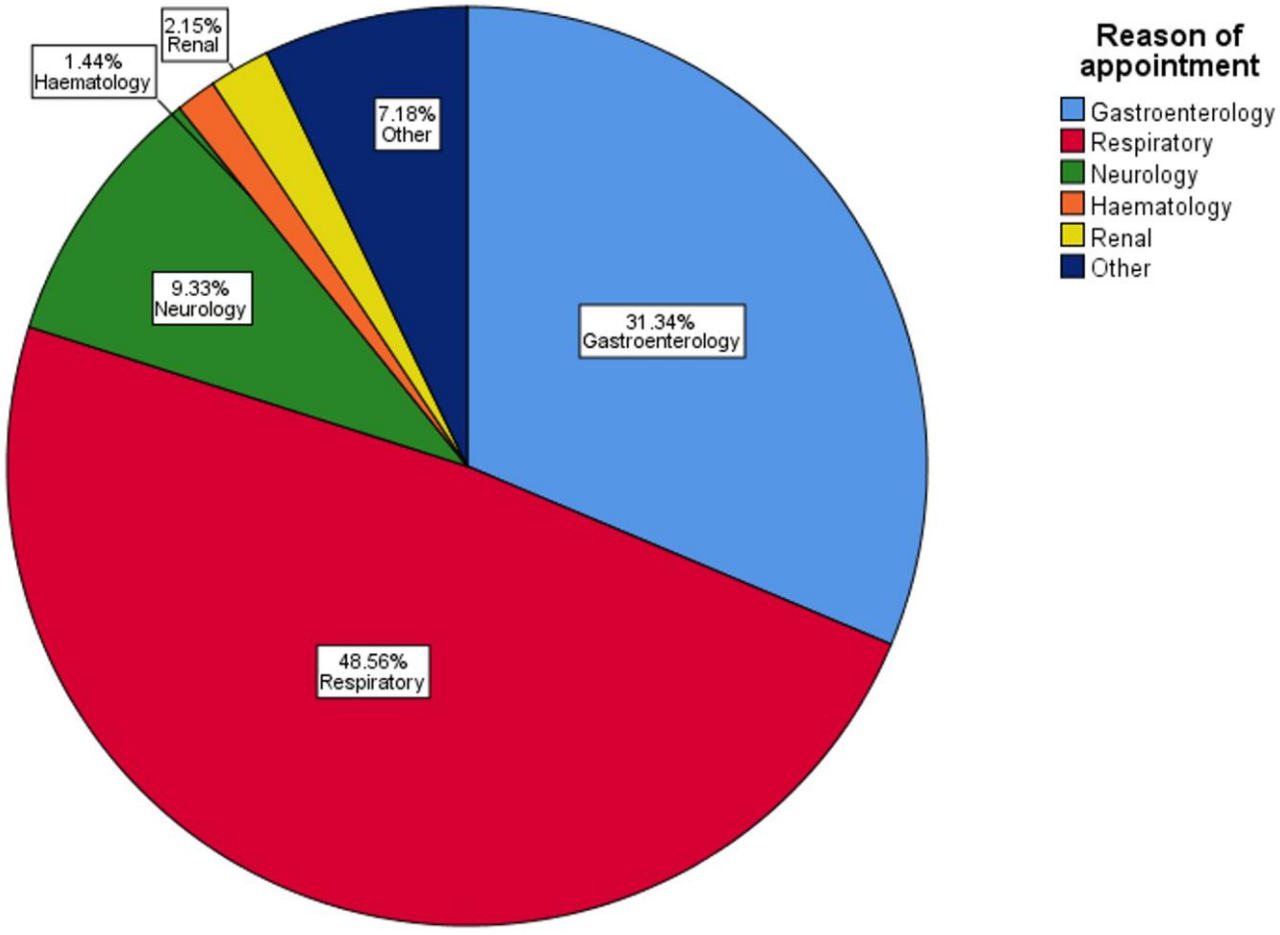
Respiratory issues were the main reasons for the appointments at general COP followed by gastroenterology and neurology issues (Figure 1).

The top five main issues for COP attendance were asthma (34.4%), viral wheeze (11.5%), abdominal pain (10.8%), headaches (4.5%) and Coeliac disease (2.9%), diarrhoea (2.9%) and constipation (2.9%). Of those with documented anthropometry, a third of asthmatics and a fourth of children complaining of abdominal pain were found to be overweight and obese.

Table 1 Descriptive statistics of included children attending general children outpatient's clinics between 2nd January 2020 and 16th March 2020

	Males	*Females*	*Group differences p-value*
N	243 (58.1%)	175 (41.9%)	
Age mean (years)	8.89 (SD=3.77)	8.66 (SD=3.67)	
BMI percentile mean	67.28 (SD=34.03)	70.58 (SD=31.18)	0.441
BMI z-score	0.978 (SD=1.90)	0.946 (SD=1.54)	0.888

Figure 1 Reason for appointment at general children's outpatient's clinic



The majority of patients were seen by the consultants (38.5%), followed by higher specialist trainees (HSTs) (29.4%), resident specialists (RSs) (16.0%), general practitioners/medical officers (9.1%) and basic specialist trainees (BSTs) (6.9%).

Height was documented in 243 patients (58.1%) and weight in 271 patients (64.8%) of appointments. The following bar graphs are a representation of the proportion of documented height and weight by doctor grade (Figures 2 and 3).

As shown in figures 2 and 3, HSTs appear to have the highest percentage of anthropometric documentation. However, as shown in Table 2, when you consider the percentage documentation of anthropometric measures in proportion to the number of patients seen, it is the RSs who documented height and weight the most. The difference in the documentation of anthropometric measures was significant between Consultant, RSs and HSTs post hoc ANOVA testing (Bonferroni adjusted) (p<0.001).

With regards to documentation of patient's BMI or weight/height percentiles, only 5 patients (1.2%) of the total number of patients in the audit, had their BMI worked out and documented in their notes, 71 patients (16.99%) had the height and weight percentiles documented, whereas in 342 patients (81.82%), neither BMI nor percentiles were documented.

Height and weight percentiles were documented more often than BMI, and mostly documented by RSs followed by HSTs (Table 2). However, still less than 17% of the total number of patients had their percentiles documented and less than 2% had their BMI calculated and documented. On the other hand, the Consultants least documented BMI or percentiles, followed by Medical Grade Officers and General Practitioners (Figure 4).

Figure 2 Frequency of documentation of patients' height by doctor grade

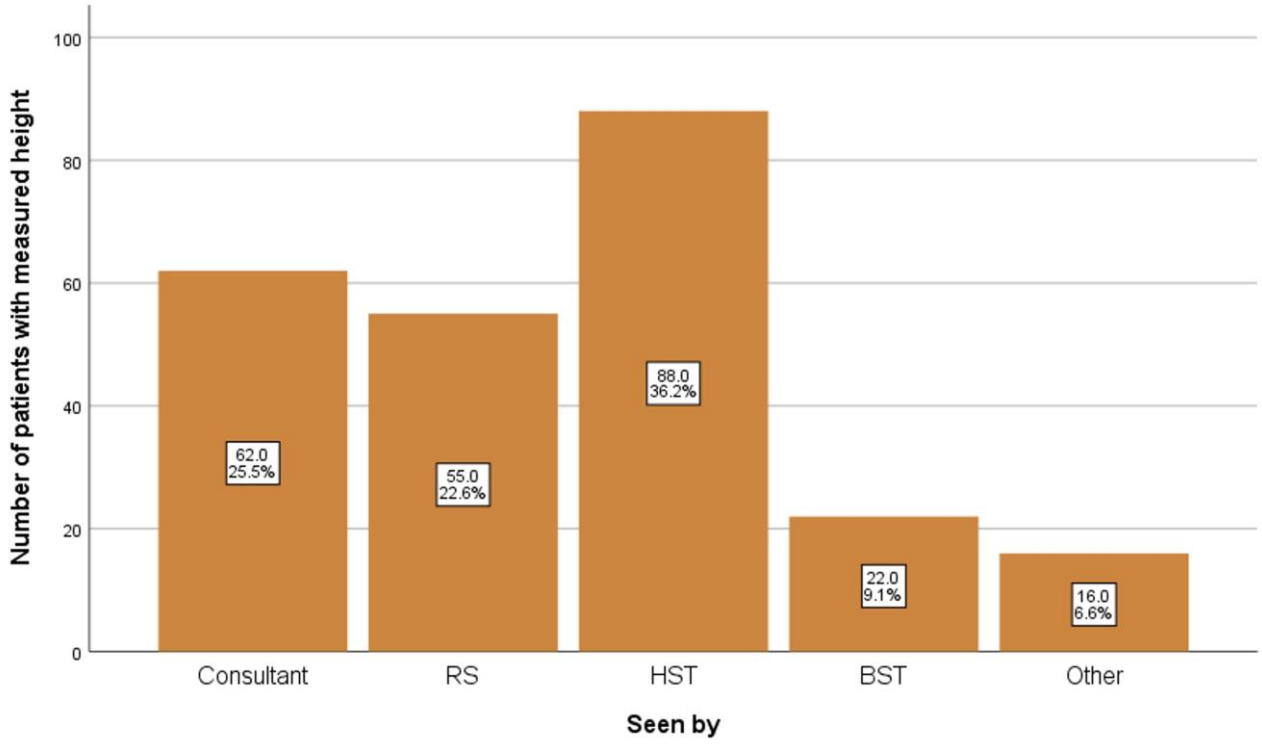


Figure 3 Frequency of documentation of patients' weight by doctor grade

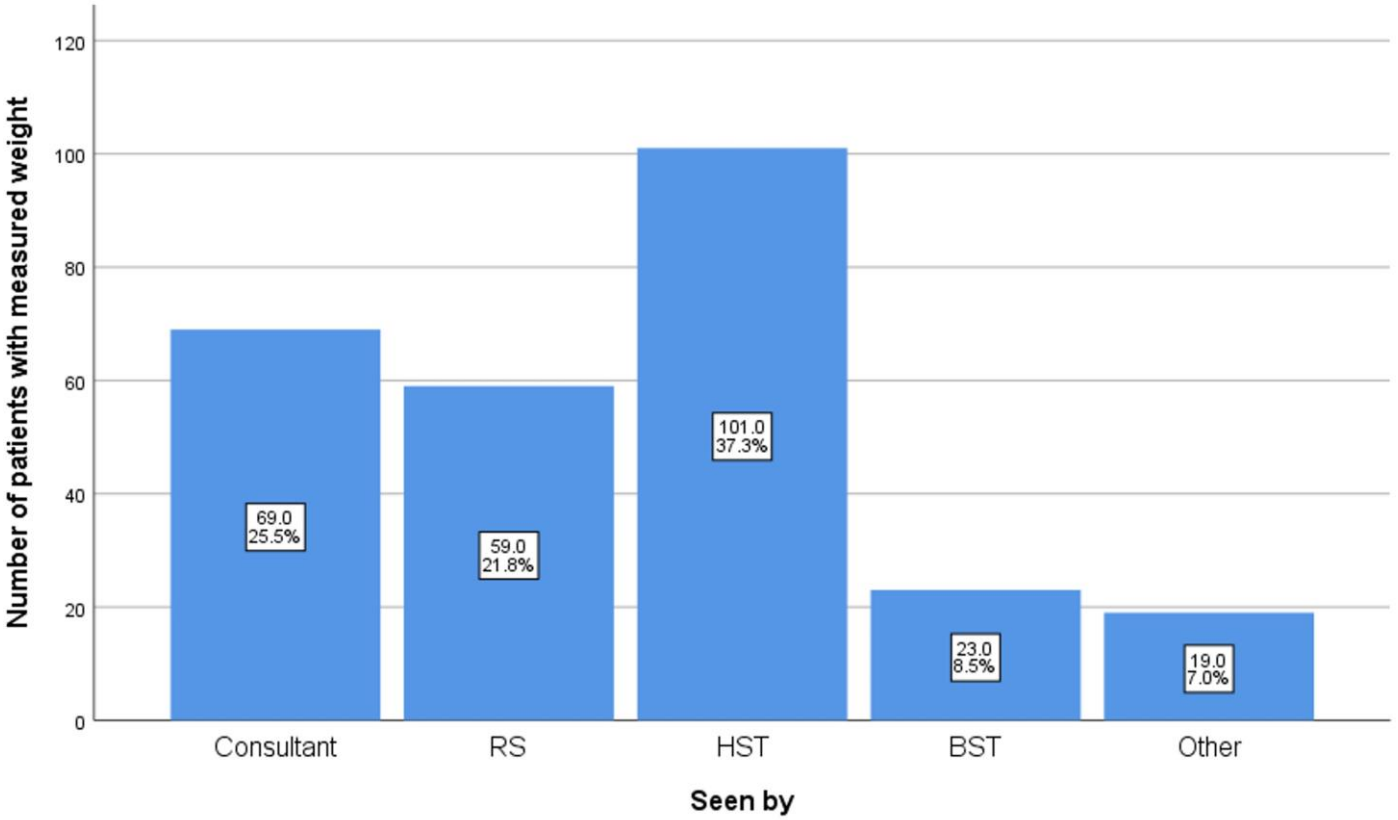
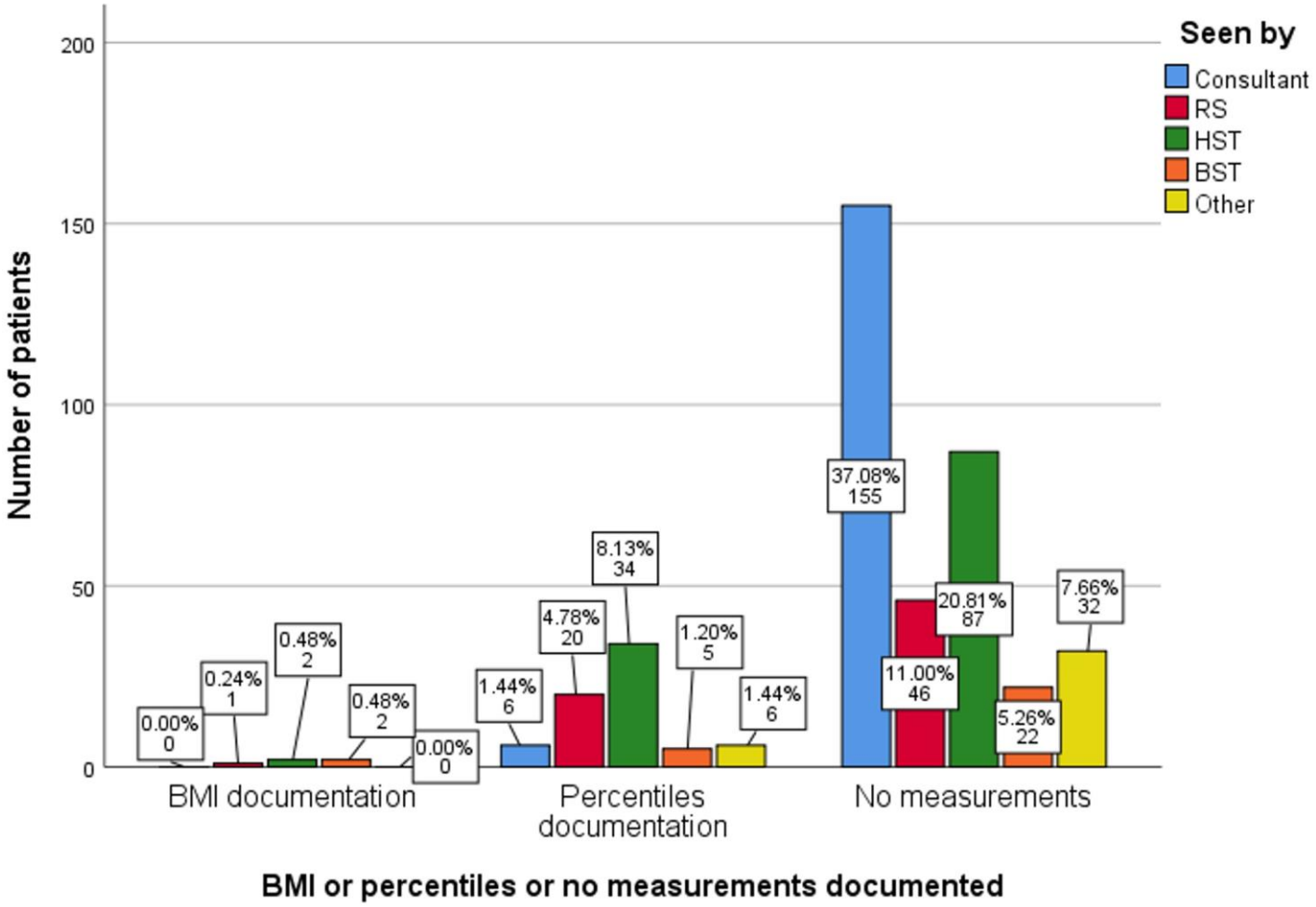


Table 2 Doctor grade and documentation of height, weight, BMI and percentiles in proportion to numbers of patients seen

Grade	Height	Weight	BMI	Percentiles
Consultant	38.5% (62/161)	42.6% (69/161)	0.0% (0/161)	3.7% (6/161)
RS	82.1% (55/67)	88.1% (59/67)	1.5% (1/67)	29.9% (20/67)
HST	71.5% (88/123)	82% (101/123)	1.6% (2/123)	27.6% (34/123)
BST	75.8% (22/29)	79.3% (23/29)	6.9% (2/29)	17.2% (5/29)
Other	42.1% (16/38)	50.0% (19/38)	0.0% (0/38)	15.8% (6/38)

Figure 4 Documentation of BMI or weight/height percentiles or no documentation according to doctor grade



BMI percentiles were calculated from the height and weight measurements documented in patients' notes (243 of 418). 42.4% of patients with documented anthropometry were overweight (13.2%, >p85) or obese (29.2%, >p95). 5.3% of patients were found to be underweight (<p2) (Figure 5).

Legend: the above was calculated when both height and weight were documented on the patients' clinical notes.

BMI z-score of 243 patients of 418, revealed slightly higher prevalence of overweight and obese children (47.4%). 27.2% patients were obese (BMI z-score >2), 20.2% were overweight (BMI z-score between 1 and 2), 41.6% had normal weight (BMI z-score between -1 and 1) and 11.1% were underweight (BMI z-score <-1) (Figures 6).

In those children in which there were no anthropometric measurements, previous episodes were perused to check whether there was any note on their height and weight. From the 175 patients with no anthropometric measurements during their last COP visit, 67 patients had a normal weight status during previous appointments, 21 patients were overweight and 31 patients were already noted to be obese but no mention on advice or updated measurements were taken during their appointment during the study period. This amounted to 29.7% of patients being either overweight or obese and not followed-

up. The other patients (32%) were either never measured, or if measured this was not documented, or their last measurements were older than 4 years.

Other investigations

Liver profiles were taken in 5 patients and were not related with obesity status (p=0.657). Blood pressure measurement was documented in 23 patients, one was noted to have a BP of p90 and another of p99 both of which were referred for 24-hr BP monitoring. Random blood glucose testing was carried out in two patients in which both were normal. HbA1c was ordered for one patient only, which was also within normal limits.

Advice

Documentation of advice given was only found in 15 patients out of 418. Only one patient was advised on diet and exercise for better weight management, the rest were only advised on a healthier diet (Figure 7).

Referrals

Out of the 114 patients who were either overweight or obese, only 2 patients were referred to the dietitian and 3 patients were referred to other clinics (ENT and paediatric nephrology).

Figure 5 Distribution of the calculated BMI percentiles

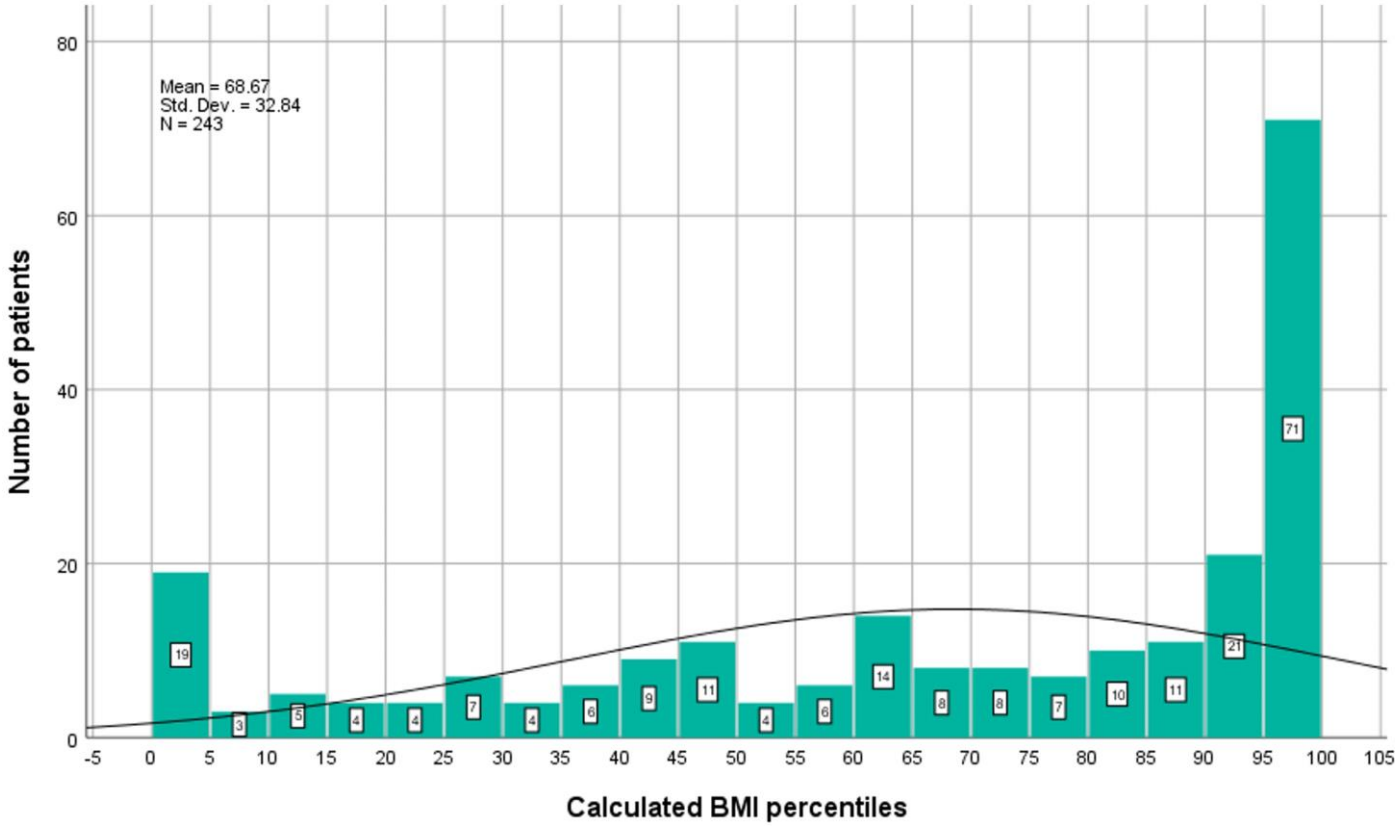
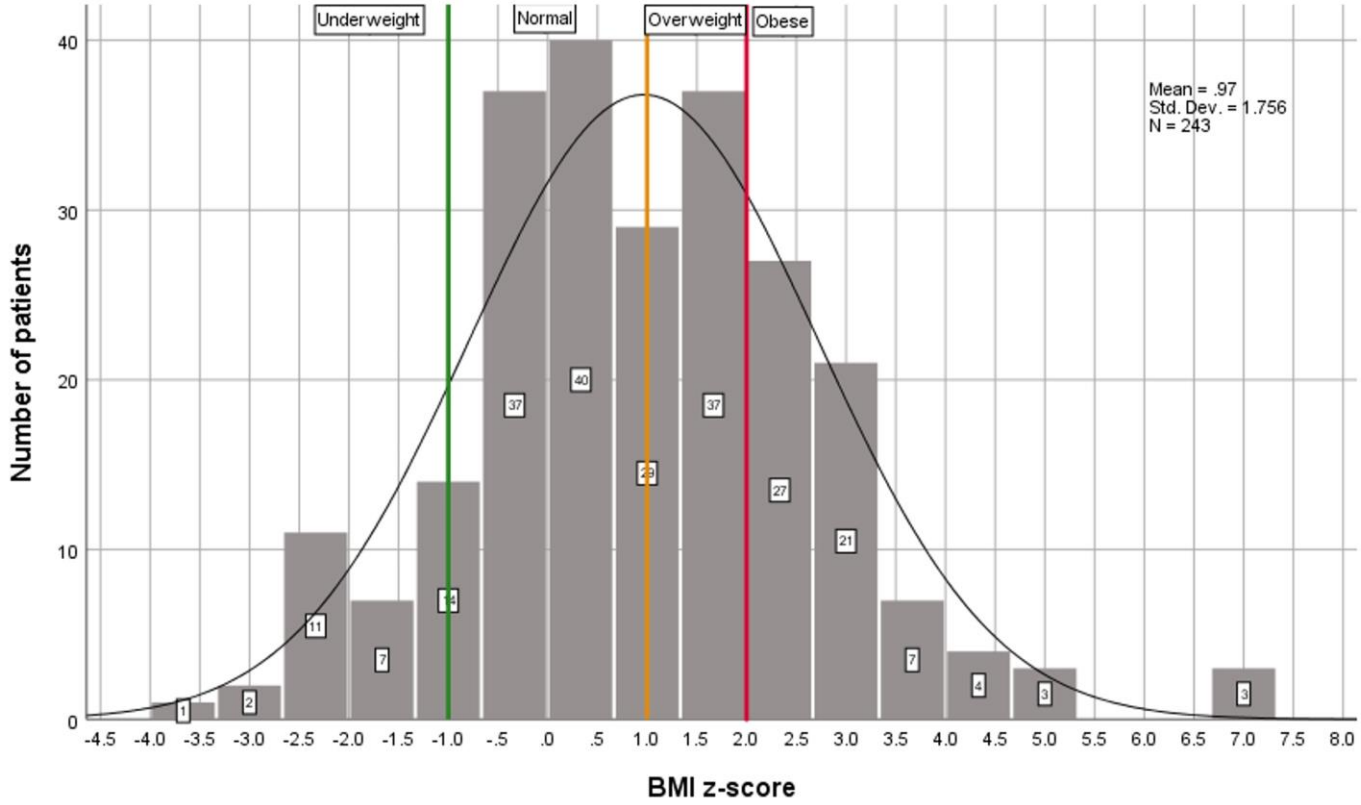
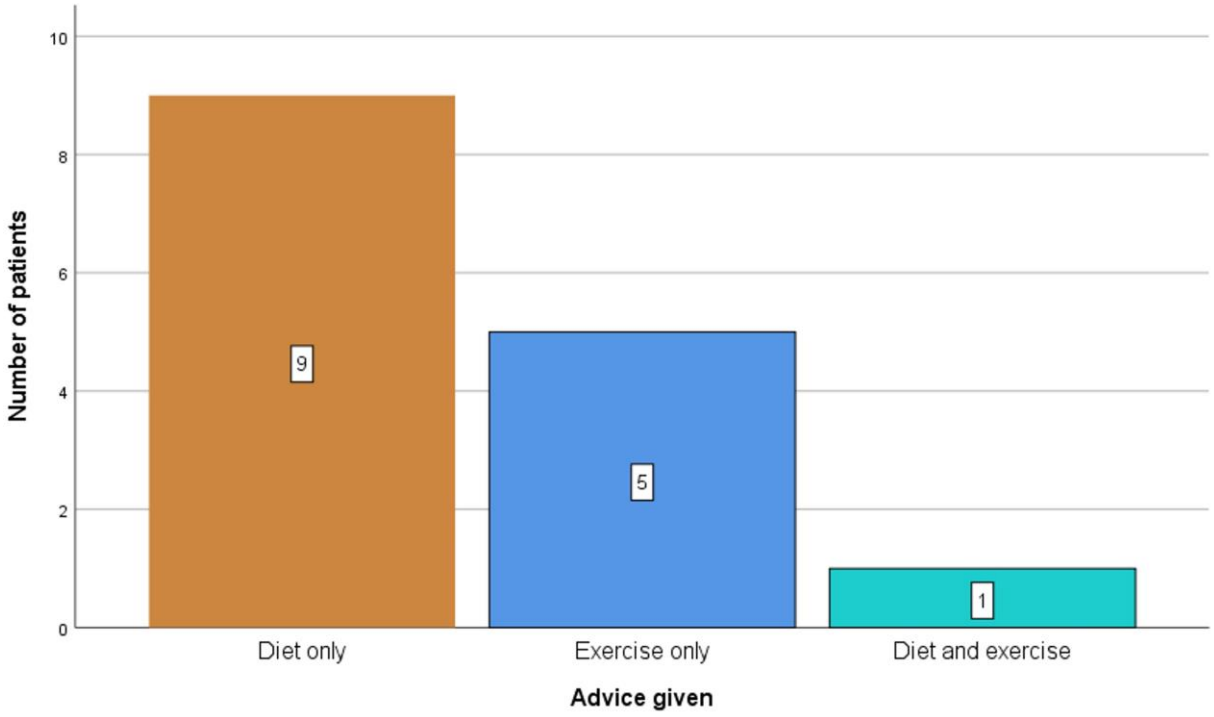


Figure 6 Distribution of the calculated BMI z-scores



Legend: Lines are depicting weight status cut-offs. Normal BMI z-scores lie between the green and orange vertical lines; Overweight BMI z-scores lie between the orange and red vertical lines and Obese BMI z-scores lie to the right of the red vertical line.

Figure 7 Documentation of advice given



DISCUSSION

The prevalence of obesity among children and adolescents has increased so rapidly over recent years that it is fast being considered an epidemic. It is an important public health problem in the developed and developing world as childhood obesity does not only lead to paediatric health issues but is also linked to premature adult mortality,[10] mental health problems,[15] social problems[16] and national economic burden.[17]

Early identification and evaluation of children with obesity should be aimed at determining the cause of weight gain and assessing for co-morbidities.[10-11] While the principal cause in most cases is an imbalance between calorific intake and physical activity, screening for potential medical and environmental factors is important.

Effective weight management programmes for children and young people can be delivered by a varied range of health care providers.[8] One venue in which weight can be evaluated in children and where additional changes may be implemented is during a children's outpatient visit. In this audit, it was noted that weight was documented in 64.8% of patients, height in 58.1%, height and weight percentiles were documented in only 17% of patients and BMI was only documented in 1.2% of a cohort of children in a typical outpatient setting. In this study, 32% of patients had never been measured at their COP visits. 60 patients with documented anthropometry had a BMI greater than the 98th centile and co-morbidity investigations were only carried out (and incompletely) in just 8 patients. These numbers are not up to standard as per current guidelines which state that all children should be screened for obesity in this setting.[8]

It was also found that 47.4% of patients whose weight and height were documented, were either overweight or obese. This prevalence is higher than that found by Grech et al in the national BMI study in 2017, in which 41.0% of children were overweight or obese.[18] One explanation for this discrepancy would be that outpatient services are more frequented by this category of patients with potentially related co-morbidities. There was a small but noteworthy discrepancy between overweight and obesity prevalence detected through BMI percentiles (42.4%) and BMI z-scores (47.4%). The major advantage of the z-score is that it permits the average and standard deviation of a group to be calculated for population-based applications. It also follows a linear scale and thus allows for summary statistics. Furthermore, it is useful for distinguishing variations at extremes of the distributions unlike percentile scores or percent of median.[19]

Furthermore, close to 30% of patients who were previously flagged up as either obese or overweight were not followed-up. The increasing prevalence of childhood obesity is associated with the emergence of typically adult-associated diseases such as type 2 diabetes, hypertension and non-alcoholic fatty disease in childhood.[11] For these reasons, weight, height and BMI should be regularly measured and documented for all out-patient visits in children.

Dietary and lifestyle advice was only documented in 7% of all children who were overweight or obese. This number could be under-reported in view of the fact that advice may have been given but not documented in the case file. This audit demonstrates poor adherence to the clinical guidance on the management of childhood obesity provided by NICE, and urgent action is required to improve

this service provision for this group of young patients.

A limitation is that this was a relatively small study on a pre-selected group of children. As the data was collected retrospectively from file documentation, anthropometric measurements may have been taken but were not documented. Although the quality of documentation in the medical setting is essential for patient continuity of care and safety, this was beyond the scope of this study. Another limitation to this study could be that possibly anthropometric measurements are likely to be taken more in paediatric patients who are perceived to be physically overweight by the assessor, therefore resulting in more overtly overweight patients being weighed, and a larger number of normal weight patients contributing to undocumented cases.

Recommendations

Suggested improvements from this audit include the use and distribution of a dietary guidelines leaflet available from the Directorate of Health Information and Research [20] for patients and their parents with additional advice on 60 minutes of daily moderate-to-vigorous physical activity (MVPA), limiting screen time to less than one hour a day, adequate sleep and healthy nutrition and beverage choice. These would accompany, but not replace, the medical consultation and serve as visual reminders to parents once the parents leave the outpatients' room. They would also ideally contain information about dietitian services should the family require further help.

Continuous medical education about childhood obesity is also essential to ensure optimization of outpatient visits. In light of the fact that only 1.75% of the patients in this audit were given a dietitian referral, it is important that adequate information is given to all paediatric staffing levels covering the different referral options and weight management programmes available.

It is important to note that this audit was carried out prior to the COVID-19 pandemic, the proportion of children being denied their physical activity has greatly escalated due to lockdowns and public concern, and therefore such studies now become more essential as the obesity rates in childhood may worsen. Innovative ideas such as online training sessions and home workouts could help mitigate this damage but require significant shift in the public mindset and new public health strategies.

A re-audit following paediatric trainee information session should also be carried out to ensure continuous assessment of appropriate local weight management screening in outpatient visits.

Currently, there is only one paediatric dietitian available at Mater Dei Hospital dealing with all nutritional issues. Hence, the waiting list to be seen when referred is long. This audit stresses the urgent need of a child obesity clinic in Malta, which could be either centralized or held in schools to reach the majority of children. Within a child obesity clinic, professional help may be provided with multi-disciplinary input, for effective management programmes of childhood obesity, including the use of FDA-approved pharmacotherapy and bariatric surgery. Only this will help prevent children with obesity to grow into obese adults with all the social, physical, mental and economic implications associated with it.

SUMMARY BOX

What is already known:

- Childhood obesity is a worldwide epidemic particularly in Malta.
- Opportunistic screening for overweight and obesity should be carried out routinely by doctors assessing children so that early identification and evaluation of children with obesity should be aimed at determining the cause of weight gain and assessing for co-morbidities.
- The NICE guideline on Obesity: identification, assessment and management (CG189), is freely available to guide gold-standard management of obesity in children.

New findings from this study

- Doctors' documentation of overweight and obesity is lacking.
- Children with overweight or obesity are not always flagged up, most are not investigated further for obesity co-morbidities and are not provided with adequate skills in order to manage their weight status (no leaflets, no dietitian referrals).
- Continuous medical education for doctors in the management of childhood obesity is required, together with the available referral options and weight management programmes available.
- This audit stresses the need of a dedicated obesity clinic in Malta.

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MMJ

REVIEW ARTICLE

Fear and uncertainty of COVID-19 pandemic bring various psychiatric problems in society

Yuliana

Background

Fear and uncertainty of COVID-19 pandemic effects will bring new mental health problems to society. This review aims to describe how fear and uncertainty of COVID-19 pandemic effects bring various psychosocial impacts and psychiatric problems. The biggest psychiatric problem during the COVID-19 pandemic is suicide. People die not because of the virus, but it was caused by their fear. Financial problems forced people to seek the easiest way of hindrance, i.e. suicide. People should believe that this COVID-19 pandemic won't last forever. It is just a temporary condition. Online mental health surveys to assess and treat any possible new/worsening psychiatric problems must be done in collaboration.

Conclusion

Understanding what effects on the brain and mental health will help a lot in dealing with fear, uncertainty, stress, and psychiatric disorder during this hard pandemic time. Mentally affected populations are various such as health workers, children, productive age people, and the elderly. People have to adapt to new normal if they want to be healthy.

Yuliana, S. Ked, M. Biomed.
Medical Faculty of Udayana University, Indonesia
lee.yuliana@gmail.com

Introduction

The coronavirus disease 2019 (COVID-19) emerged first in Wuhan, China, in December 2019. It became pandemic in March 2020. Some provinces of China started to begin school and working activities gradually. Other countries were still struggling to combat the COVID-19 pandemic. However, serious mental disorder threat is forgotten. Mental problem is secondary health effect of COVID-19 pandemic that should be tackled perpetually. The secondary effect means that the COVID-19 doesn't only cause the infection, but it also disturbs the mental health of uninfected people. A lot of uninfected medical staff had insomnia. They were afraid of getting infected while they were taking care of COVID-19 patients. They also get worried about transmitting the infection to their family at home.[1]

In Indonesia, the COVID-19 outbreak began when the case of two people from West Java province tested positive for infection after coming into contact with someone from Japan Japan while visiting Indonesia. This person from Japan was confirmed positive for COVID-19 when he was examined in Malaysia. Furthermore, positive cases of COVID-19 infection continue to increase until now. The increase in positive cases of COVID-19 infection has caused anxiety and fear in some Indonesians and some consider COVID-19 infection as a political conspiracy both domestically and abroad.[2]

Between September 2020 and February 2021 are the highest peak months for positive cases in Indonesia and the death rate has risen sharply, causing the Indonesian government to implement large-scale social restrictions to prevent an increase in the number of infected people. These restrictions prevent children from attending school and studying online. Learning online creates many problems, including an increase in the cost of purchasing internet quotas, children are bored and find it difficult to concentrate on learning compared to learning offline. This restriction also causes the economy to decline, shops become empty of buyers and factory-produced goods are not selling well. There are many layoffs, causing unemployment to increase. This condition creates fear of losing a job and losing a source of income to finance family life. COVID-19 patients who undergo isolation or who are hospitalized in the intensive care unit (ICU) also experience depression, loneliness, anxiety, and even depression due to the scary atmosphere in the isolation room and ICU, including anxiety about the high cost of care. After recovering, still have to face the negative stigma from neighbors and relatives.[3]

Limitations of social and economic activities might trigger psychosocial problems. Insomnia, depression, alcohol or substance misuse, domestic violence, child abuse, cyberbullying, relationship breakdown, divorce, a severe form of existing disease, or insomnia could happen. Restrictions on work, mobility, and social support had poor effects on mental health for patients, health workers, and society. Blow up of COVID-19 news in social media causes amplification effects of this tiny virus in our memory and feelings.[4] Zhang *et al.* did a multicenter survey of 1,563 medical staff to measure the Insomnia Severity Index score. The study result revealed that 36.1% of participants had a total score of more than 8. The factors that contributed to the score were worried about being infected, uncertain about disease control effectiveness, being a doctor, and working in an isolation unit. The depression prevalence was 50.7%. The anxiety prevalence was 44.7%. Stress-

related symptoms were 73.4%. Those numbers revealed that mental health should get a serious concern during the COVID-19 pandemic.(4) The Chinese Psychological Society, Association for Mental Health, the Chinese Psychological Society, the Chinese Psychiatrist Association, and the Chinese Society of Psychiatry, sent 430 psychiatrists to Hubei Province to support the local mental health service. There are some guidelines released by the National Health Commission. The guidelines include emergency psychological interventions for different populations, psychological assistance hotlines, psychological self-help, and related ethical issues.[5]

Prolonged insomnia due to constant fear amid uncertain conditions in the fields of education, health, and economy caused by the impact of the COVID-19 outbreak increases the incidence of suicide. In Canada, the projected suicide rates per 100,000 increased to 14.0 in 2020 and 13.6 in 2021 in a model of prediction.[6] Suicide has been reported in India and Italy.(7,8) Two nurses committed suicide after getting infected by COVID-19.(8) This might be due to the highest prevalence rate of anxiety in Italy among other countries. Italia had an anxiety prevalence rate of 80-83%, while China, Iran, Turkey, and Spain had prevalence ranged between 7% to 64%. Italy also had the highest prevalence rate for depression (67%). China got an approximately 65% prevalence rate for depression among COVID-19 patients from some studies.[9]

The focus and purpose of this paper are to emphasize that fear and uncertainty feeling during the COVID-19 pandemic are normal. It is included all relevant kinds of literature during the COVID-19 pandemic. However, this feeling must be well managed to prevent the emerging mental problems and worsening of preexisting mental disorders. When the fear and uncertainty feeling is not well recognized, then it can develop into psychiatric problems. The worse and significant problem is suicide. Therefore, while many countries must accompany the management and treatment of COVID-19 effort without forgetting mental health support systems.

Risk factors of suicide among the population during the COVID-19 pandemic

Various psychosocial impacts and psychiatric problems during the COVID-19 pandemic were viewed from some data of the studies. Hao *et al.* did a case-control study in 76 psychiatric patients and 109 healthy control subjects from Chongqing, China in February 2020. PTSD-like symptoms in the COVID-19 pandemic were more obvious in psychiatric patients than in healthy controls (31.6% vs 13.8%, respectively). The anxiety prevalence was higher in psychiatric patients than healthy controls (23.6% vs 2.7%). More psychiatric patients had depressive symptoms than healthy controls (22.4% vs 0.9%). Risk factors of developing worsening symptoms in psychiatric patients were lack or delay of routine medication, consultation, and supply. These conditions might trigger suicidal thoughts in some psychiatric patients.[10]

About 29 percent of all hospitalized COVID-19 patients were health workers. Health workers are at increased risk of having psychological distress. They must save patients while protecting themselves from getting COVID-19 infection. Quarantined health workers were at increased risk of social isolation. They will face complicated emotional feelings and psychological distress. When they are in distress condition, they wouldn't be able to make the right clinical decision in treating the patients. The condition will further increase

the risk of getting COVID-19 infection for patients and health workers. The rising number of positive cases and death patients will further increase the burden for health workers.[11,12]

Fear, uncertainty, panic, and distress might increase the risk of getting post-traumatic stress disorders (PTSD).[12-13] PTSD prevalence was found in approximately 30% of the children who separated from parents during the COVID-19 pandemic. These disorders might have long effects after the pandemic has ended. Thus, the vicious cycle continues.[13] The PTSD prevalence among COVID-19 patients was 93% in some studies in China, Iran, Italy, Turkey, and Spain. Untreated PTSD is a risk factor for suicide.[9]

Stress and anxiety trigger suicide

COVID-19 pandemic has great impacts on our daily life. Stress and anxiety of uncertainty might develop into a psychiatric problem. Stress activated the hypothalamus-pituitary-adrenal (HPA) system. It will disturb normal sleep. Later on, insomnia will also increase stress. Long-term insomnia might trigger psychiatric disorders. Vaccine, the number of positive cases, treatment, and prevention are the most common topic about COVID-19. However, mental health is forgotten. There are various psychosocial aspects of psychiatric problems. COVID-19 might impose irreversible psychological impacts. News and social media amplify the COVID-19 pandemic real condition. Sometimes the frightening term such as “end of the world” was used. Fear, uncertainty, depression, grief, anxiety psychosis, and suicide occur afterward. Psychiatric patients will have an increased risk of worsened symptoms and diseases.[4]

Insomnia as early detection to prevent suicide

Mental problems that usually arise among health workers and society are extreme fear (phobia) of illness, alcohol/tobacco abuse, anxiety, active stress disorders, depression, divorce, hysteria, schizophrenia, and suicide.[1,12] Phobia sometimes happens when listening, seeing, or reading anything related to the COVID-19 pandemic. Those negative reactions and emotions will inhibit daily activities. Therefore, it is essential to detect early signs of COVID-19 phobia. Precise and prompt diagnosis of COVID-19 phobia will prevent the next stage of complex mental problems. Nevertheless, due to the new condition of COVID-19 phobia, there is no specific assessment for it.[14]

Insomnia is an early risk factor for anxiety, depression, and suicidal behavior. To prevent suicide and psychiatric problems, insomnia should be treated aggressively. It should be done among individuals besides psychiatric patients. Insomnia patients should be assessed for suicidal ideation and suicide intent. Thus, suicidal death can be avoided.[15]

The effect of stress on immune system disorders and susceptibility to COVID-19 infection

Stress is a threatened homeostatic state upon exposure to extrinsic or intrinsic adverse forces. Stress is divided into acute stress and chronic stress. Acute stress only lasts for a few minutes or hours, while chronic stress can last for days, weeks, or months.[16]

The immune system is influenced by neuronal interactions via feedback mechanisms and complex connections and interactions between immune cells and the central nervous system. In the context of the COVID-19

pandemic, social disruption stress increases and lasts a long time. Prolonged stress will release some stress hormones by activation of the hypothalamic-pituitary-adrenal (HPA) axis and catecholamines through the autonomic nervous system (ANS). ANS consists of the sympathetic and parasympathetic nervous systems. The main neurotransmitters are norepinephrine (NE), epinephrine (E), and acetylcholine (Ach). Prolonged stress due to the COVID-19 pandemic makes the hypothalamus (paraventricular nucleus) release corticotropin-releasing hormone (CRH) and arginine vasopressin. The paraventricular nucleus stimulates locus coeruleus to send the signals to the sympathetic and parasympathetic preganglionic neurons. Decreasing of Ach and increasing of NE and E stimulate immune cells to release proinflammatory cytokines such as (TNF-α, IL-1β, IL-6, and interferon). This condition decreases tryptophan and increases kynurenine. $CD4^+$ and $CD8^+$ T cells cannot work well. There is dysfunction of the Antigen Presenting Cells (APCs), in the form of decreased expression of Pathogen Recognition Receptors (PRRs). The failure of the PRRs expression causes a decrease the ability of phagocytosis and elimination of viruses by Natural Killer (NK) cells in the innate immune system whereas in the adaptive immune system it causes the inactivity of lymphocytes and inhibits the formation of neutralized antibodies. These conditions lead to susceptibility to COVID-19 infection. Besides, proinflammatory cytokines increase ACE2 via stimulation of the sympathetic nervous system and the renin-angiotensin system. Thus, people will easily get COVID-19 infection due to increased susceptibility. This pathway can be seen in Figure 1.[17]

Chronic stress mechanisms increase the risk of suicide

In chronic stress conditions (for example depression), the sympathetic nervous system is activated continuously. There are also elevated levels of pro-inflammatory cytokines. Indoleamine 2,3-dioxygenase and tryptophan 2,3-dioxygenase convert tryptophan to kynurenine and will be converted into quinolinic acid. Therefore, quinolinic acid level is elevated. This condition causes three pathways, the first one is a high concentration of extracellular glutamate and persistent activation of excitatory neurons that result in excitotoxicity. The second pathway is selective activation of N-methyl-d-aspartate (NMDA) receptors, which will trigger the bond between neurotrophin (pro-BDNF) with receptor $p75^{NTR}$. These bonds will activate NF-κB / c-Jun N- terminal kinases pathway that triggers apoptosis. NF-κB is sequestered in the cytosol by their inhibitor IκB and towards the cell nucleus to synthesize pro-inflammatory cytokines, one of which is TNFα. TNF-α will activate the apoptotic caspase by binding to the TNF-α receptor. C-Jun N- terminal kinases (JNKs) through a series of intermediates, activates p53 and p53 activates Bax which initiates apoptosis. Excessive stimulation of the NMDA receptor also causes an increase in the concentration of glutamate which can cause excitotoxicity. The third pathway is free radical formation. In chronic stress conditions, free radicals, both the reactive oxygen species (ROS) and reactive nitrogen species (RNS), are derived from endogenous sources (mitochondria, peroxisomes, endoplasmic reticulum, phagocytic cells, etc.). These free radicals cause oxidative and nitrosative stress, these conditions cause disturbances in neurotransmitters, especially serotonin. Excitotoxicity, apoptosis, and decreasing

serotonin cause neurodegeneration and mood disorders. Reduction in Glial fibrillary-associated protein (GFAP) may cause atrophy of astrocytes and trigger downregulation of other astrocytic genes including EAAT. Alterations in levels of GFAP may reflect pathological regulation of neuronal function and survival as well as abnormal synaptogenesis and neurotransmission. Reduction GFAP is related to mood disorders that cause a person to become depressed and have suicidal thoughts (Figure 2).[17]

Figure 1 Interaction among stress, autonomic nervous system, and immune system. Stress can increase susceptibility to COVID-19 infection through stimulation of the renin-angiotensin system and release of pro-inflammatory cytokines. ACE2 = Angiotensin-Converting Enzyme 2, NE = Norepinephrine, E = Epinephrine, Ach = acetylcholine, TNF-α = Tumor Necrosis Factor –α, IL = Interleukin, CD = Cluster of Differentiation

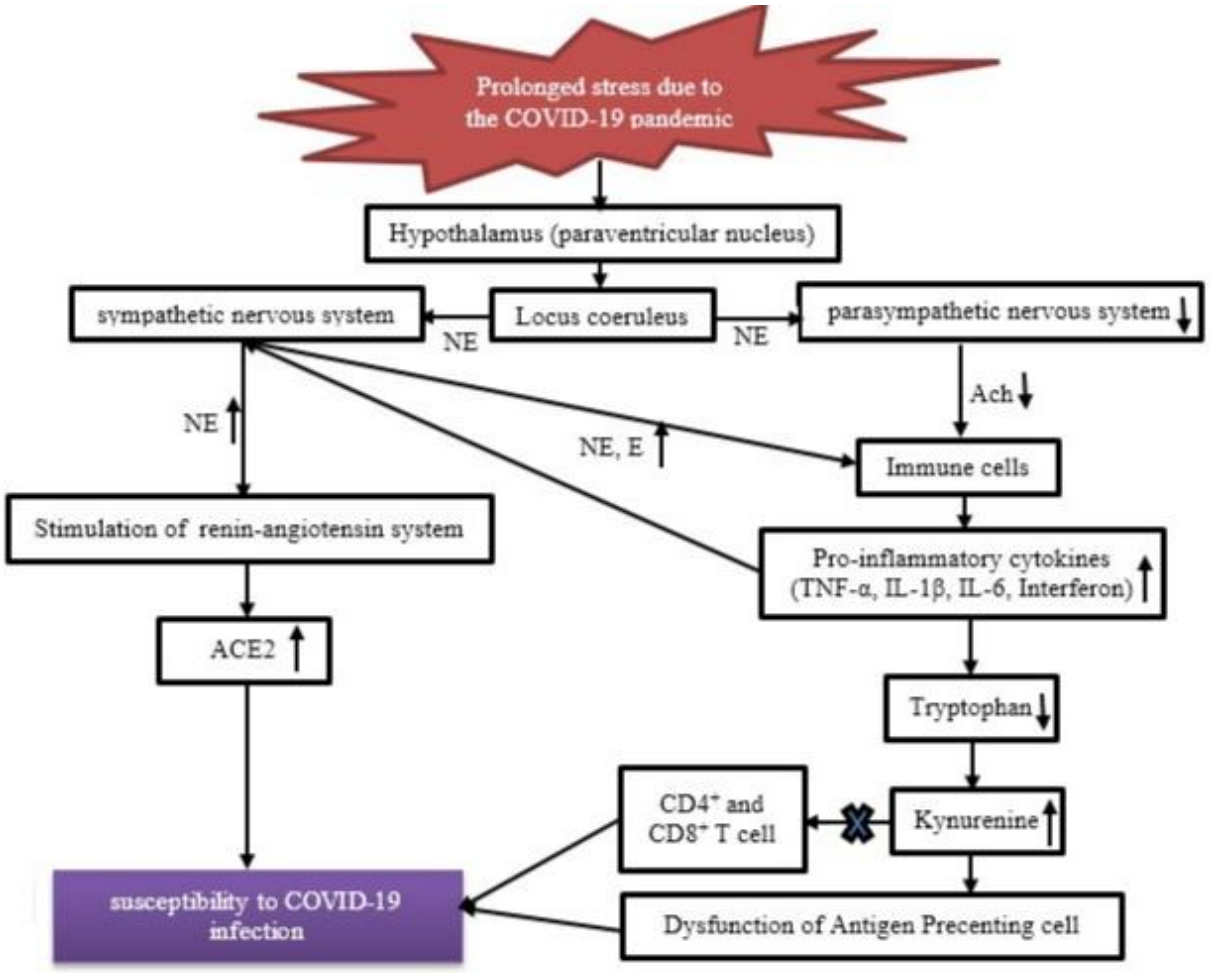
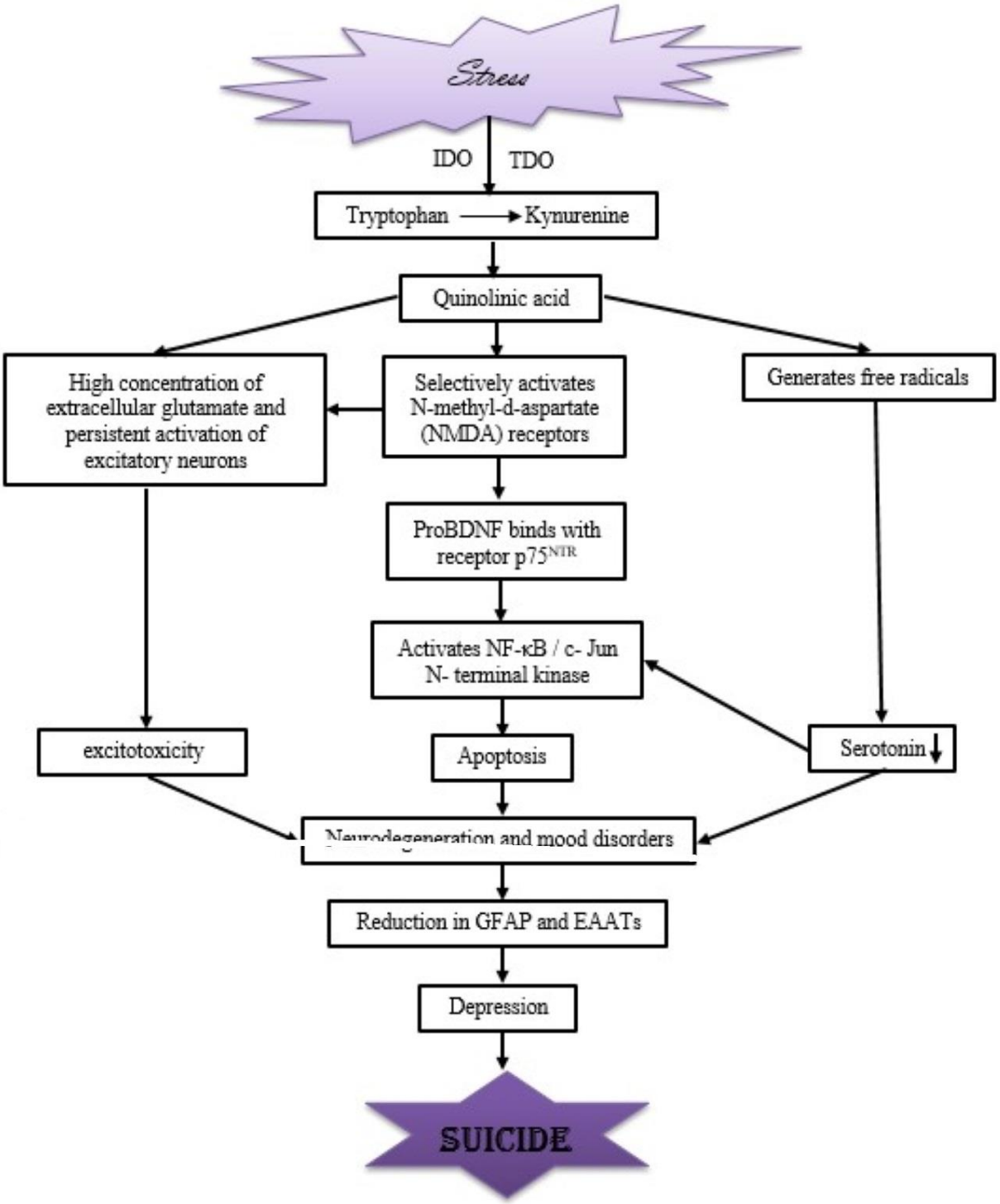


Figure 2 Molecular mechanism of suicide induced by chronic/prolonged stress. Stress can increase quinolinic acid concentration. This condition leads to apoptosis, excitotoxicity, and serotonin depletion. Neurodegeneration and mood disorders take place. Depression occurs. Severe depression induces suicide. IDO = indoleamine 2,3-dioxygenase, TDO = tryptophan 2,3-dioxygenase, BDNF = Brain-derived neurotrophic factor, NMDA = N-methyl-d-aspartate, NF-κB = nuclear factor kappa-light-chain-enhancer of activated B cells, GFAP= Glial fibrillary associated protein, EAATs = Glial-specific excitatory amino acid transporters.



Limitation of the literature

This paper described the fear and uncertainty feeling that cannot be abandoned. It is a normal feeling. However, cohort studies were not found. For example, when the researcher found that the anxiety and depression scores were high in some population, the population were not followed in a specific time, whether they will have any suicide or not. Further cohort researches are recommended to study psychiatric disorders in the future that are derived from fear and uncertainty feelings.

Conclusion

Mental health building is a key component in eradicating psychiatric problems due to the COVID-19 pandemic. Failure to recognize the loss and grief feeling might lead to suicide. Various psychosocial impacts of psychiatric problems in society can be prevented if fear and uncertainty are decreased. Emotional and mental health problems could decrease immunity and inhibit the recovery of COVID-19 infection. Each individual has their feelings and struggles. Therefore, the strategy should be flexible enough to meet every person's problem. Excessive social media browsing about COVID-19 should be stopped. People should eat a healthy diet, maintain a positive lifestyle, build a positive relationship with family and friends. Adaptation to a new normal life should be done. Positive thinking, obeying government guidelines, and doing indoor sport might help increasing endorphin for happy feelings. Long-term mental health care management must be a priority in surviving. Psychiatrists and psychologists should be strengthened by online training during this pandemic period to minimize new psychiatric disorders. Psychological first aid and online mental health survey must be applied continuously. Suicide prevention is a critical issue. Financial support, early detection of mental problems, and labor support are essential steps.

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MMJ

CASE REPORT

Spontaneous pneumomediastinum in idiopathic pulmonary fibrosis

Luca Conti, David Bilocca, Caroline Gouder, Stephen Montefort

Spontaneous pneumomediastinum is an uncommon occurrence and is usually self-limiting. We present an 84-year-old gentleman with idiopathic pulmonary fibrosis (IPF) presented with worsening breathlessness and a worsening dry cough with no history of haemoptysis. A computerised tomography (CT) scan of the thorax revealed marked worsening of the pulmonary fibrotic changes as well as extensive pneumomediastinum extending throughout the length the mediastinum. A diagnosis of spontaneous pneumomediastium was made. The patient was managed conservatively with oxygen and was discharged home after his dyspnoea gradually improved.

Luca Conti MD MRCP(UK) *
Department of Respiratory Medicine
Mater Dei Hospital
Msida, Malta
luca.conti@gov.mt

David Bilocca MD MRCP(UK) Spec Cert (Resp Med)
Department of Respiratory Medicine
Mater Dei Hospital
Msida, Malta

Caroline Gouder MD MRCP(UK) Spec Cert (Resp Med)
Department of Respiratory Medicine
Mater Dei Hospital
Msida, Malta

Stephen Montefort MD FRCP PhD
Department of Respiratory Medicine
Mater Dei Hospital
Msida, Malta

*Corresponding author

Background

Spontaneous pneumomediastinum is an uncommon occurrence and is usually self-limiting. Spontaneous pneumomediastinum is the presence of free air around mediastinal structures and is thought to be secondary to alveolar or honeycomb cyst rupture due to raised intrapulmonary pressure on coughing, blunt force trauma to the chest, asthma, various types of interstitial lung diseases, including interstitial pneumonia associated with connective tissue diseases, including dermatomyositis and rheumatoid arthritis.[1]

We herein report a rare case of spontaneous pneumomediastinum with thoracic-wall subcutaneous emphysema occurring in an elderly gentleman with idiopathic pulmonary fibrosis (IPF).

Case report

An 84-year-old gentleman with a background of IPF on long-term oxygen therapy, presented to a scheduled outpatient appointment complaining of worsening dyspnoea and weight loss. The patient described recent worsening shortness of breath after a persistent coughing bout. He was unable to perform his activities of daily living unassisted and was house bound in view of the progressive dyspnoea (Modified Medical Research Council Dyspnoea scale 4). There was no history of haemoptysis, pleurisy, chills, rigors or fever suggesting an underlying infective pathology. Medical history was otherwise significant for glaucoma and hypothyroidism on replacement therapy. Two years prior, he was found to be hypoxaemic on ambulation and thus was initiated on 2 L/minute home oxygen therapy which he was compliant to.

The patient was an ex-smoker, having stopped smoking 6 years ago, with a 35-pack-year history. On clinical examination he was clubbed, cachectic and breathless, but was not in respiratory distress. He was otherwise haemodynamically stable with oxygen saturations of 87% on room air and diffuse fibrotic crepitations in both lung fields. The patient was unable to withstand repeat pulmonary function testing on the day of presentation.

An urgent computerised tomography (CT) scan of the thorax revealed marked worsening of the pulmonary fibrotic changes especially in the lung bases with honeycombing, traction bronchiectasis and diffuse interstitial thickening. It also showed extensive pneumomediastinum (white arrows, figure a-c) with air extending throughout the length of the mediastinum and into the subcutaneous tissues of the neck along the vascular sheath (red arrows, figure b-c). In retrospect, there were no clinical signs of surgical emphysema of the anterior chest wall and neck and Hamman's sign was not appreciated.

On further questioning, the patient had not undergone any recent tracheobronchial or gastroscopy procedures effectively ruling out oesophageal rupture in absence of features of shock. There was no evidence to suggest pulmonary or mediastinal infection from gas-forming organisms or recent trauma to chest. Thus, a diagnosis of spontaneous pneumomediastium was made and it was managed conservatively with oxygen and bed rest. The patient was reviewed at outpatients after a few days with radiological improvement.

Figure 1 **Spontaenous pneumomediastinum in a patient with idiopathic pulmonary fibrosis.**

(a) Axial, (b) coronal, (c) transverse CT images shows extensive pneumomediastinum (white arrows) and subcutaneous emphysema (red arrows) without any co-existing pneumothorax.

Discussion

Spontaneous pneumomediastinum is an uncommon occurrence and patients usually present with pleuritic chest discomfort with worsening dyspnoea, odynophagia and neck pain. Subcutaneous emphysema is commonly noted, particularly in the neck. Hamman's sign, a crunching sound, synchronous with the patient's heartbeat, could be noted on examination.

Air tends to track within the mediastinal planes, ranging from the submadibular space, retropharyngeal space and the vascular sheath in the neck to the retroperitoneal space and pelvis. Thus, pneumomediastinum is frequently associated with other forms of extra-alveolar air, such as pneumopericardium, pneumothorax, subcutaneous emphysema, pneumoretroperitoneum and pneumoperitoneum as a result of these communications.[2]

CT imaging is the diagnostic gold standard in suspected spontaneous pneumomediastinum.[3] Spirometry and peak expiratory flow rate is contraindicated in patients as it may exacerbate spontaneous pneumomediastinum in view of intrathoracic pressures.[4] Uncomplicated spontaneous pneumomediastinum is managed conservatively with bed rest, adequate analgesia and avoidance of manoeuvres than increase intrathoracic pressures such as Valsalva manoeuvre.[5] In patients who are increasingly symptomatic, high-flow oxygen inhalation therapy is used in order to enhance its re-absorption by nitrogen washout.[6]

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CASE REPORT

Ertapenem-induced delirium

Francesca Farrugia, Marisa Abela

Introduction

Ertapenem is an intravenous antibiotic within the class of carbapenem antibiotics which are highly effective against severe bacterial infections. These antibiotic agents exhibit a wider spectrum of action when compared to penicillins and cephalosporins despite carbapenems being part of the beta-lactam antibiotic class.

Case presentation

The patient is an 85-year old gentleman who developed a lower urinary tract infection and left 4th toe osteomyelitis. Ertapenem was prescribed according to the sensitivities of the cultured organisms. After two weeks of antibiotic treatment the patient developed new-onset delirium, agitation, hallucinations and throat discomfort. Ertapenem was stopped and the new symptoms resolved within 48 hours.

Discussion

Delirium, agitation, hallucinations and throat discomfort are documented side-effects of ertapenem. In such cases the withdrawal of ertapenem results in a resolution of symptoms.

Francesca Farrugia* MD, MRCP(UK), MA
Department of Geriatrics
St Vincent de Paul long term care facility,
Luqa, Malta
francesca.farrugia.1@gov.mt

Marisa Abela MD, Dip Ger (Hons), M Phil
Department of Geriatrics
St Vincent de Paul long term care facility,
Luqa, Malta

*Corresponding author

Introduction and case presentation

The patient is an 85-year old gentleman, a known case of peripheral vascular disease, currently a resident in a long term care facility, who developed pyuria and a wound exuding pus from the left 4th toe. Urinalysis, urine cultures, a wound swab and a left foot X-ray were taken. The urinalysis confirmed the presence of a urinary tract infection with urinalysis white blood cells of 500uL and positive urinalysis nitrites. The urine cultures showed a *Klebsiella pneumoniae* ESBL positive infection. The left 4th toe wound swab showed a methicillin resistant *Staphylococcus aureus* (MRSA) infection and 2 strains of coliforms including *Proteus* spp. The left foot X-ray showed cortical irregularity of the lateral side of the middle phalanx of the left 4th toe and osteopenia suggestive of early osteomyelitis. He had a normal renal function and an elevated C-reactive protein level of 90mg/L.

Ertapenem 1g daily intravenous and clindamycin 300mg 6-hourly per oral were prescribed according to the microbiology results and antibiotic sensitivities. After two weeks of ertapenem therapy, the patient developed new-onset delirium, agitation, throat discomfort and hallucinations which had an acute onset over a period of 24 hours. The patient had no prior neurocognitive disorders. The physical examination was unremarkable and all the parameters were within normal limits. The left 4th toe wound showed clinical improvement with decreased erythema and no further pus exudation. The pyuria had resolved and the urine was now clear. An electrolyte profile and a renal function were all within normal limits. Ertapenem treatment was immediately discontinued and these symptoms all resolved within 48 hours.

Discussion

Common side-effects of ertapenem include gastro-intestinal symptoms such as nausea, vomiting and diarrhoea, thrombophlebitis and skin reactions. Delirium and hallucinations are documented side-effects of ertapenem therapy and the frequency of such adverse reactions is unknown from data to date. Another rare documented adverse reaction includes encephalopathy.[1] The Naranjo algorithm was used to assess the probability of the symptoms being secondary to an adverse drug reaction.[2] The score for this patient was 3 which indicated a possible adverse reaction to ertapenem with a dramatic improvement in the patient's mental status upon the discontinuation of the drug. This patient had been taking the drug for 14 days, with the symptoms occurring only at the end of the recommended 14-day course of ertapenem for the *Klebsiella pneumoniae* lower urinary tract infection.

The risk factor which may have predisposed this gentleman to these adverse reactions was his chronological age. The main patient-related risk factors for carbapenem-induced neurotoxicity are renal failure, low body weight, a history of cerebrovascular disease and advanced age.[3] Carbapenem-induced neurotoxicity occurs via interactions with the ϒ-amino butyric acid receptor A ($GABA_A$).[4,5] The interaction happens through the C-2 side-chain of the carbapenem nucleus.

Pharmacovigilance is of utmost importance in the monitoring and assessment of adverse drug reactions. It enables the identification of hazards related to pharmaceutical drugs and provides for the minimisation of harm that may occur to patients. Individual case safety reports with an identifiable patient and reporter, a suspected drug and the adverse

event are crucial in providing more information to the relevant Medicines Authority to investigate and examine adverse reactions related to the particular drug.

Conclusions

We are presenting this case report in order to highlight the possible neurologic adverse reactions of ertapenem. The identification and discontinuation of ertapenem as the cause of the delirium, hallucinations, agitation and throat discomfort in this gentleman brought about the resolution of these symptoms.

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CASE REPORT

Prenatal diagnosis of retroperitoneal lymphangioma – a case report

Mandy Collict, Shana Apap Buttigieg, Naged Megally, Daliso Chetcuti, Andee Agius, Alberto Vella

Retroperitoneal lymphangiomas are rare congenital anomalies of the lymphatic system. Here we report a case of foetal retroperitoneal lymphangioma accurately diagnosed in the third trimester of pregnancy in a primigravida lady, using a combination of ultrasonography and magnetic resonance imaging. Prenatal diagnosis and multidisciplinary team approach is crucial in the management and prognosis of infants with lymphangiomas.

Mandy Collict* MD, MSc (Rep Health), MRCSEd
Department of Obs & Gynae
Mater Dei Hospital
Msida, Malta
mandycaruana89@gmail.com

Shana Apap Buttigieg MD
Department of Obs & Gynae
Mater Dei Hospital
Msida, Malta

Naged Megally MBBCh, NT(FMF)
Department of Obs & Gynae
Mater Dei Hospital
Msida, Malta

Daliso Chetcuti MD, EFOG-EBCOG
Department of Obs & Gynae
Mater Dei Hospital
Msida, Malta

Andee Agius MD, MClinRes, MSc, BSc(Hons)
Department of Obs & Gynae
Mater Dei Hospital
Msida, Malta

Alberto Vella MD, FRCS(Ed), FRCOG
Department of Obs & Gynae
Mater Dei Hospital
Msida, Malta

*Corresponding author

Introduction

Lymphangiomas are congenital anomalies of the lymphatic system. These are benign fluid-filled tumours of the lymphatic vessels that may infiltrate or cause displacement of adjacent structures. Lymphangiomas are known to affect about 1 in 6000 live births, with approximately 50% presenting at birth and 90% becoming apparent at two years of age.[1] Retroperitoneal lymphangiomas are rare, accounting for only 1% of cases.[2] Foetal lymphangiomas may be associated with other problems and their prognosis depends on the location, size and the presence of other associated abnormalities. Here, we report a case of foetal retroperitoneal lymphangioma diagnosed in the third trimester of pregnancy.

Case Report

A 35-year-old Maltese lady, who was in her first pregnancy, was noted that her foetus had a large multiseptated right sided abdominal mass on routine visit at 33 weeks of gestation. (Figure 1). No other anomalies were detected. Previous ultrasound scans including a detailed anomaly scan at 21 weeks and a 4D scan at 28 weeks of gestation were normal. For further characterisation of the mass, a magnetic resonance (MR) imaging of the pelvis was carried out two weeks later and the diagnosis of a retroperitoneal lymphangioma was confirmed (Figure 2).

Figure 1 Multiseptated hypoechogenic avascular abdominal mass measuring 5.36cm by 4.55cm at the level of the lumbar spine on ultrasonography.

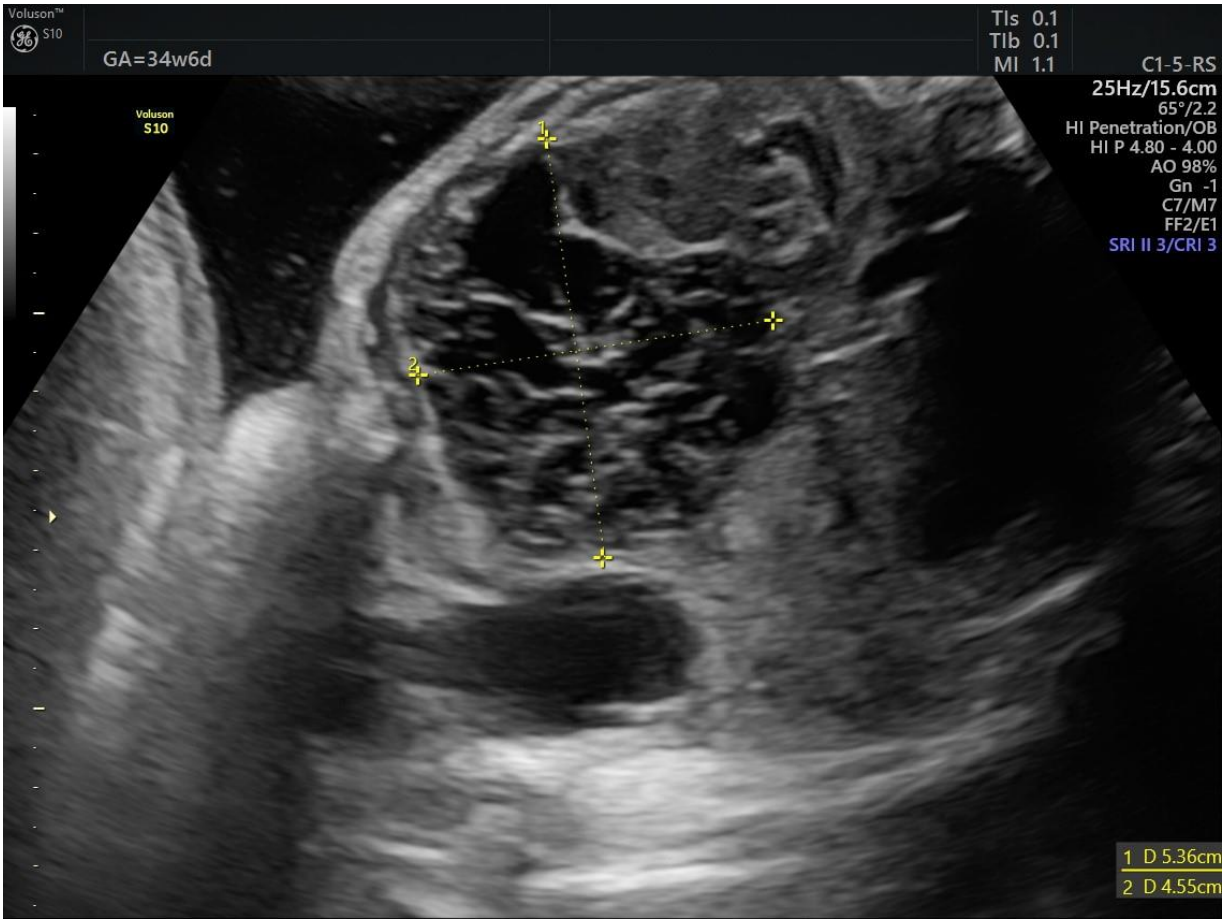
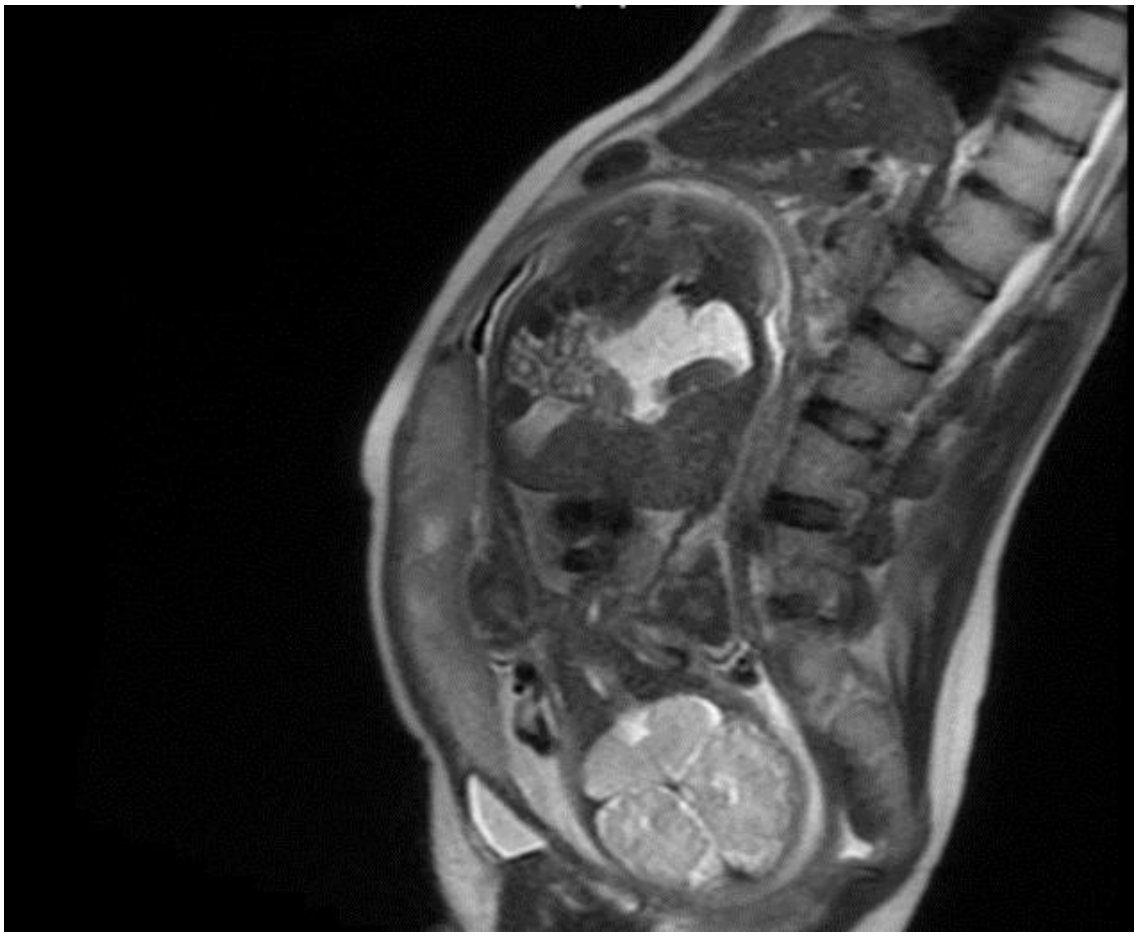


Figure 2 MR sagittal image of the mother showing a large cystic abnormality that is occupying the right half of the foetal abdomen (white arrow).



The case was discussed at the multidisciplinary team meeting and together with the parents a plan for an elective caesarean section at 39 weeks of gestation was made. The mother presented at 37^{+2} weeks with spontaneous rupture of membranes and the baby was delivered via an emergency lower segment caesarean section and was transferred to neonatal paediatric intensive unit for close monitoring.

On examination, the baby was found to be pink, haemodynamically stable with no obvious dysmorphic features and soft abdomen. Chest and abdominal X-rays were normal. An ultrasound of the abdomen was performed on day two of life and a multicystic abnormality was noted to be occupying the right half of the abdomen, extending from the liver edge down to the pelvis measuring approximately 7cm by 4cm by 5cm. This further confirmed the antenatal diagnosis of retroperitoneal lymphangioma.

The baby remained well and was deemed fit for discharge on day four with a plan to repeat ultrasound abdomen after six weeks and a repeat MR abdomen and pelvis in 3 months time.

Discussion

Lymphangioma is a benign hamartoma of the lymphatic system, consisting of multiple dilated vessels. These arise due to a defect in

the development of the lymphatic system, which usually develop from the sixth week of gestation.[3] Lymphangiomas can be classified histologically into 3 main types; simple lymphangiomas consisting of lymphatic capillaries, cavernous lymphangiomas which are made up of larger lymphatic vessels with fibrous adventitia, and cystic lymphangiomas which consist of multiple cysts. All the three types may coexist within the same lesion.[3] Approximately 75% of lymphangiomas are located in the head and neck, while the other 25% involve extremities (11%), trunk (11%), abdomen and genitalia (3%), or mediastinum (1%).[4] Abdominal lymphangiomas are reported to occur most commonly in the mesentery of the small bowel, with the retroperitoneum being the second most common site.[4]

Foetal lymphangiomas are frequently associated with karyotypic or other abnormalities like polyhydramnios, skin oedema and hydrops, thus making prenatal diagnosis important.[5] Although spontaneous regression can sometimes occur in a foetal lymphangioma with normal chromosomes, large lymphangiomas require a perinatal multidisciplinary team approach. Here the possible management options such as prenatal aspiration of the cyst, elective caesarean section, or a delivery mode which will avoid foetal damage are dicussed.[6] Accurate prenatal diagnosis permits a planned delivery, adequate intrapartum monitoring and immediate postnatal resuscitation which could lead to an improved prognosis.

On ultrasonography and MR imaging, cystic lymphangiomas appear as sharply defined, unilocular or multilocular cystic lesions, with thick or thin walled septa. On ultrasound, the fluid may be anechoic, and there may be variable internal echoes or even fluid filled levels, due to bleeding and fibrin deposition.[7] In our case, both antenatal sonography and MR imaging accurately diagnosed the retroperitoneal lymphangioma. The accuracy, safety, immediate availability and its low cost had made ultrasonography the imaging modality of choice in the antenatal assessment for foetal anomalies.[8] However, with the advances in MR imaging, this modality has become a useful tool for the prenatal diagnosis of complex foetal anomalies. In addition, MR imaging has the additional benefit of providing more comprehensive images, accurately delineates the exact extent of the lesion and it is not operator-dependent.[5] MR imaging can also provide improved prenatal parental counselling and postnatal therapeutic planning.[9]

The treatment of choice of retroperitoneal lymphangiomas is complete surgical excision. The long-term prognosis is excellent if complete excision has been achieved. If not, the child needs to be followed up with serial scans to exclude recurrence of the lesion. Another alternative treatment is image-guided percutaneous catheter drainage of lymphangioma followed by sclerotherapy.[10] Successful outcomes have been reported following the use of intralesional bleomycin, sclerotherapy with OK-432, or percutaneous embolization with Ethibloc.[2,11,12]

In conclusion, foetal retroperitoneal lymphangiomas are very rare benign tumours which can be accurately diagnosed prenatally using a combination of ultrasonography and MR imaging. A multidisciplinary perinatal team approach should be used to manage such cases and the prenatal diagnosis is crucial in the management and prognosis of infants with lymphangiomas.

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