RESEARCH ARTICLE

A one-month demographic analysis of ophthalmic referrals to the Emergency Ophthalmic Service at Mater Dei Hospital, Malta

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ABSTRACT

Background

Prompt recognition and referral of patients with ophthalmic emergencies are essential for preserving vision. For this reason, importance should be given to researching how the ophthalmic emergency services are utilized in Malta in order to facilitate improvements.

Objective

This demographic study, conducted over 32 days at Mater Dei Hospital in Malta, aimed to explore the characteristics of patients referred to the ophthalmic emergency department, including patient demographics, referral sources and reasons for referral, providing insights into the utilization of emergency services.

Method

This retrospective demographic study was carried out over the span of one month (from December 2023 to January 2024). Patient referral data was gathered from emergency department triage sheets, followed by the collection of demographic data (including gender, age, place of habitation, ethnicity, source of referral, presenting complaint and necessity for further ophthalmic review) from the Clinical Patient Administration System for all Ophthalmic Emergency Services attendees.

Results

Findings revealed gender disparities, age-related trends, regional distribution and the significance of self-referrals. Notably, 18% of cases required further ophthalmic review, emphasizing the complexity of ocular conditions.

Conclusion

This study offered valuable insights into the different characteristics of patients accessing the Maltese Ophthalmic Emergency Service at Mater Dei Hospital. It underscored the significant number of patients utilizing this service and revealed demographic trends and referral sources. By acknowledging these trends, it should become possible to allocate resources more effectively and target interventions to meet the diverse needs of the community. While acknowledging its limitations, the aims and objectives of this study were achieved.

Keywords
Demographic analysis; emergency service, hospital; Malta; ophthalmology; retrospective study.

INTRODUCTION

Prompt recognition and referral of patients with ophthalmic emergencies is crucial to preserving vision (Langan, 2021). Such ophthalmic cases require a review by a specialist having a unique subset of knowledge/examination techniques/ equipment (Grewal & Gabr, 2021). Prompt recognition and referral of such patients is just as important as having the necessary capacity in the ophthalmic department for prompt review of said patients.

Stridhar et al (2015) conducted a demographic study examining the patterns of utilization of the ophthalmology emergency department (ED) which showed that more than one-third of patients accessing the ophthalmic ED were classified as non-emergent and did not actually require ophthalmic emergency services (OES).

In Malta, emergency ophthalmic referrals are seen by doctors within the Ophthalmic Outpatients/Ophthalmic Ward (depending on the time of day) based within Mater Dei Hospital (MDH) (Galdas et al., 2005). Moreover, Primary Healthcare (PHC) in Malta currently offers limited ophthalmic services (including optometry, glaucoma clinic and screening) (Government of Malta, 2021a). The provision of these services all require specialised equipment, training time and funding for trainers. Urgent cases can also be seen by a general practitioner (GP) within a health centre (HC) and treated if the appropriate equipment is available and if the level of exposure to ophthalmology is sufficient to ensure a safe outcome.

Patients requiring emergency ophthalmic care at MDH are typically referred from the HC, a private GP (Government of Malta, 2021b), or may present themselves directly at the MDH ED for registration and triage according to the urgency of concern.

By carrying out this demographic study, the authors aimed to highlight any demographic trends in how the Maltese OES are being utilized, understand cohort patterns of attendance and referral patterns to OES, and hence use this data to optimize resource allocation and service delivery.

Objectives

The objectives of this study were:

- The evaluation of the number of patients who were referred to the OES (over a 32-day period) within MDH based on patient characteristics and reasons for referral;
- The identification of any areas for improvement in the OES in MDH and community services.

METHOD

This retrospective demographic study was carried out over the span of one month (from December 2023 to January 2024). Approval was sought from the Departmental Chairperson of Ophthalmology at MDH prior to collection of data. Ethical approval was not required for this study since the authors did not make any contact with the patients involved, patients were not identifiable from data collected and all raw data was deleted after data processing. Data was analyzed using descriptive statistics to identify patterns in demographics and referral sources. Nonparametric tests were used to assess the significance of differences in referral patterns across demographic groups.

The inclusion criteria for this study included all the patients who attended the OES after being registered through the ED triage system. Patient demographics and referral data were gathered from ED triage sheets, followed by collection of the following information from the Clinical Patient Administration System (CPAS):

- Day of presentation to the ED
- Gender/age/habitation/ethnicity
- Source of referral
- Time of registration at the ED
- Presenting complaint (categorized into groups as can be seen in Table 1)

- Whether the patient required further ophthalmic review
- Whether it was a new case/review/consultation

To maintain participant anonymity, each patient then received a code. The collected and anonymised data were analysed to reveal any pattern of attendance with the following formulation of results, conclusions, and recommendations.

Any patients already admitted in MDH at the time of review were excluded from the data set. Paediatric patients were grouped together with the adult population, without any further differentiation.

The categories in Table 1 were formulated to create a classification of presenting complaints which were identified during history taking. Whilst the table does not include scientific diagnoses, it includes the patients' complaints and reason why they attended the OES. The exact diagnosis was not the scope of this study.

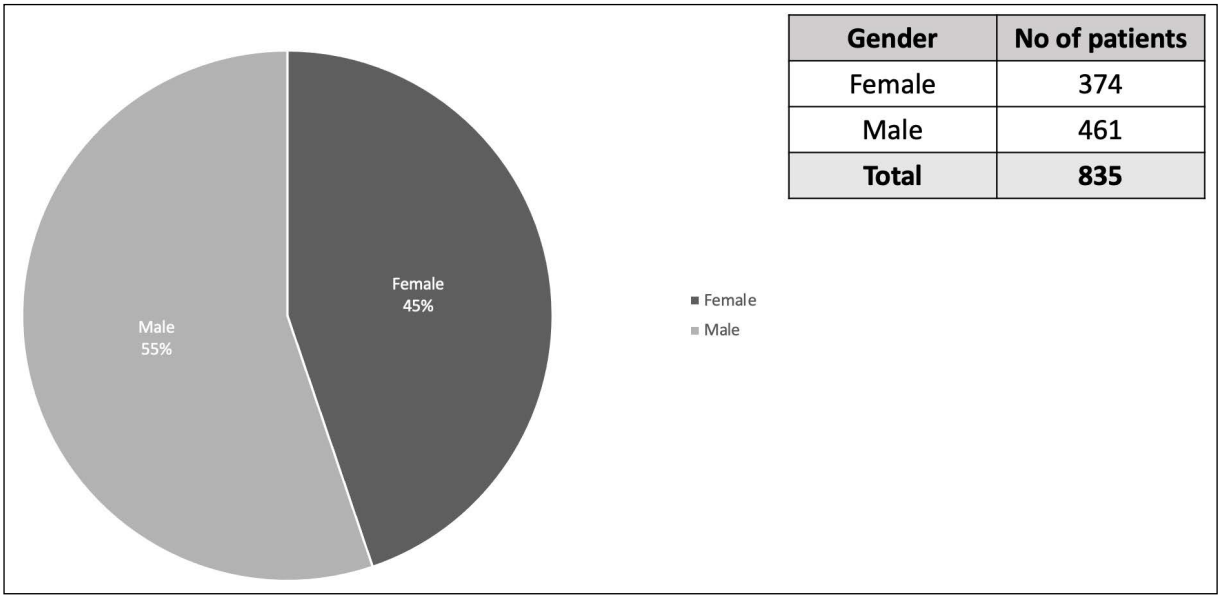
Table 1 - Categories of presenting complaints in the Ophthalmic Emergency Department

Injuries	**Eye discomfort and redness**	**Intraocular pressure**
• Foreign body • Chemical injury • Trauma (direct injury)	• Eye irritation • Eye redness • Eye pain	• Increase in intra-ocular pressure (IOP) • High IOP
Ocular conditions and infections	**Vision issues**	**Lacrimation and ocular surface issues**
• Eye infection • Herpes Zoster • CRVO (central retinal vein occlusion) • Recurrent uveitis • Chalazion • Retinal haemorrhage	• Blurred vision • Eye floaters • Visual disturbances • Decrease in visual acuity • Blurred vision and flashes • Transient decrease in vision • Vision loss • Binocular diplopia	• Increased/excess lacrimation • Subconjunctival haemorrhage • Peri-orbital redness
Neurological conditions	**Eyelid issues**	**Miscellaneous**
• Headache • Bell's Palsy • Migraine with aura • Left optic disc swelling	• Eyelid swelling • Eyelid twitching • Eyelid drooping	• Eye check-up • Photosensitivity • Post-operative complications

RESULTS

The results cover data collected over 32 reviewed days with a total of 835 patients who presented to OES.

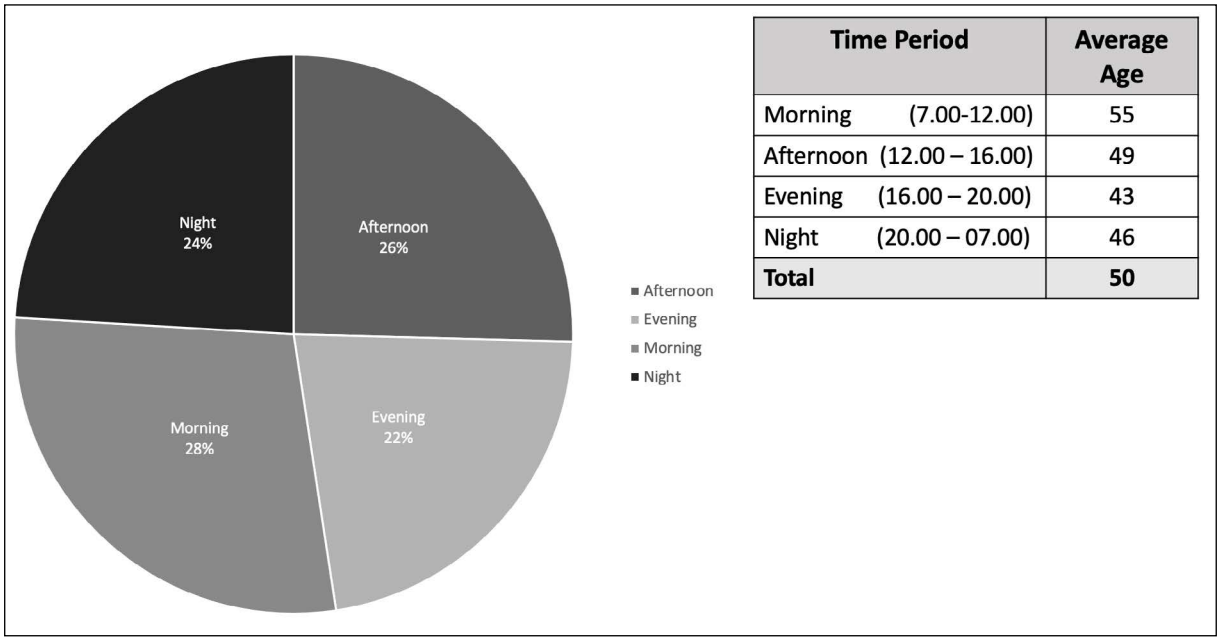
As can be seen in Figure 1, a larger proportion of males were found to make use of OES in comparison to females.



Gender	No of patients
Female	374
Male	461
Total	**835**

Figure 1 - Percentage of male vs female attendees at the Ophthalmic Emergency Department

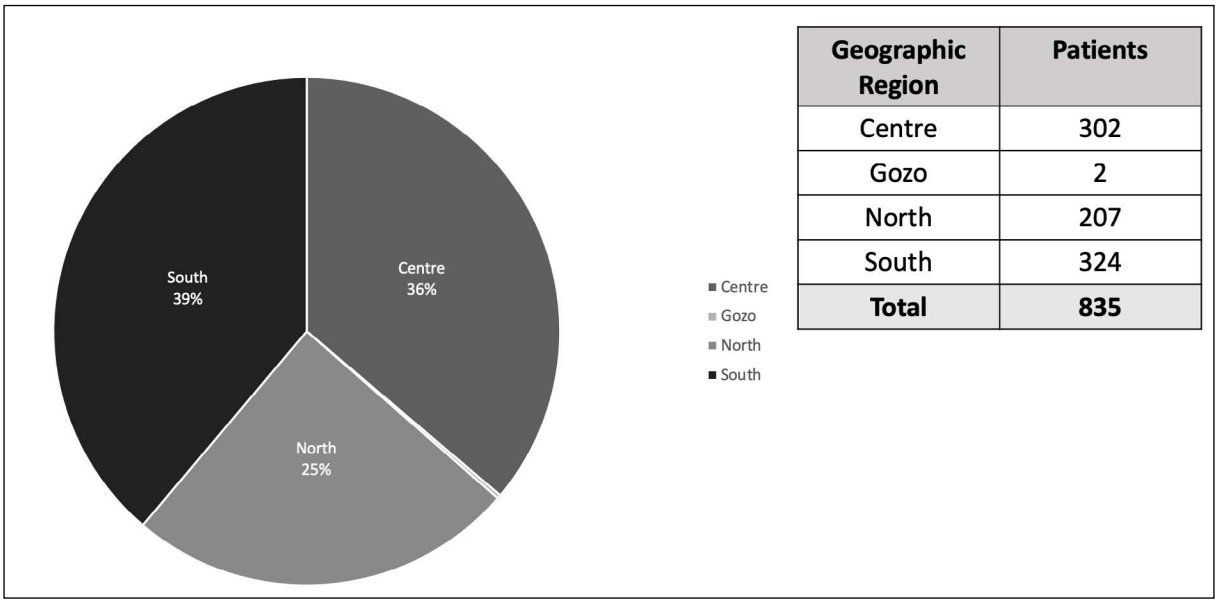
The majority of the older population (>50 years old) attended OES in the morning, in comparison to those in their 40's who were more likely to make use of OES in the afternoon, evening and night. Moreover, Figure 2 also outlines that even though work-load was almost evenly distributed throughout the four mentioned time periods, OES was most frequently utilized in the morning and afternoon, with the evening being the least utilized time slot.



Time Period		Average Age
Morning	(7.00-12.00)	55
Afternoon	(12.00 – 16.00)	49
Evening	(16.00 – 20.00)	43
Night	(20.00 – 07.00)	46
Total		**50**

Figure 2 - Average age of Ophthalmic Emergency attendees according to time period

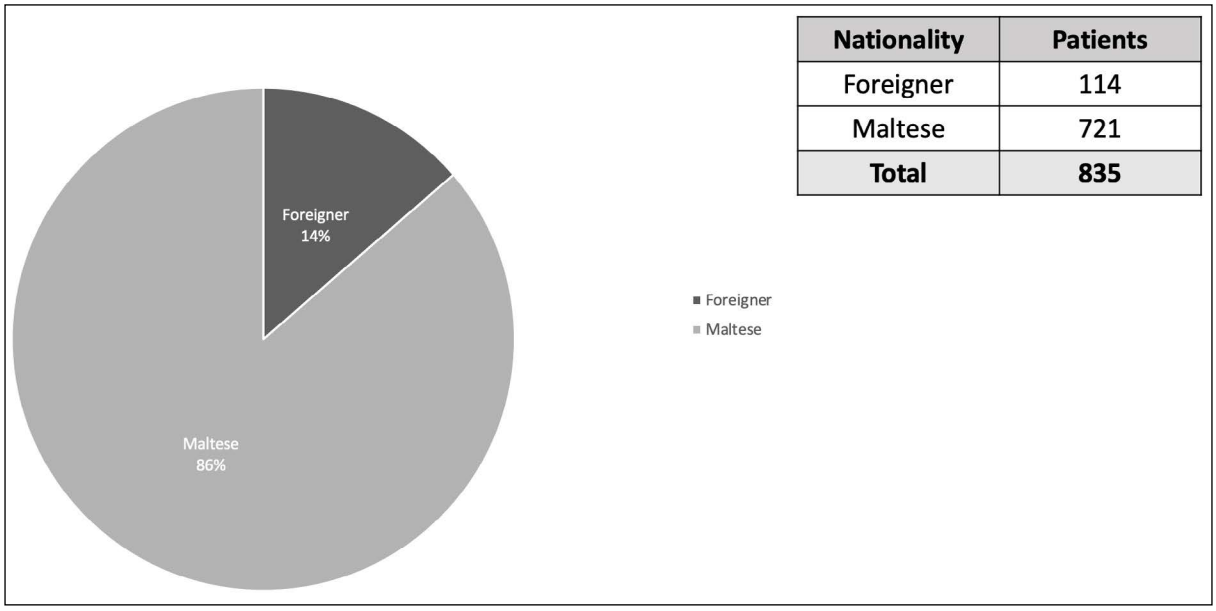
From the collected data, the majority of patients making use of OES originated from the central and south regions of Malta, with only 25% of attendees being from the north regions, and only 2 patients originating from the island of Gozo. These findings can be appreciated in Figure 3.



Geographic Region	Patients
Centre	302
Gozo	2
North	207
South	324
Total	**835**

Figure 3 - Percentage of Ophthalmic Emergency attendees from north, central and south regions of Malta

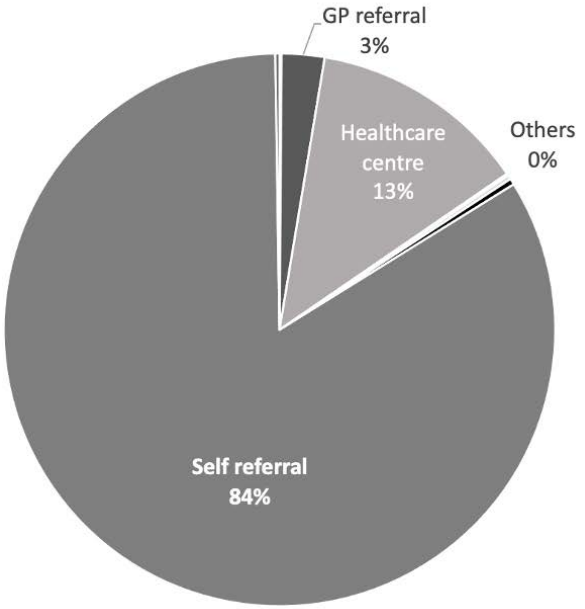
As illustrated in Figure 4, the large majority of OES attendees were of Maltese Nationality. Approximately 14% OES attendees were of foreign nationality and therefore the patient pool consisted of a diverse mix of local and foreign individuals.



Nationality	Patients
Foreigner	114
Maltese	721
Total	**835**

Figure 4 - Percentage of Ophthalmic Emergency attendees who were Maltese and foreigners

A large discrepancy in sources of referral to OES can be easily noted in Figure 5. The majority of OES attendees (84%, n= 698) self-referred themselves to MDH OES, with only 13% (n= 107) having been formally referred from a healthcare centre. 'GP referral' signifies private GP visits whilst 'Healthcare Centre' refers to GP reviews done at a government community treatment hub.



Referral Source	Patients
Self-referral	698
Healthcare Centre	107
GP Referral	21
Private hospital	3
MCH referral	2
SVPR referral	2
Ambulance	1
KGH referral	1
Total	**835**

Figure 5 - Source of referral to Ophthalmic Emergency Services

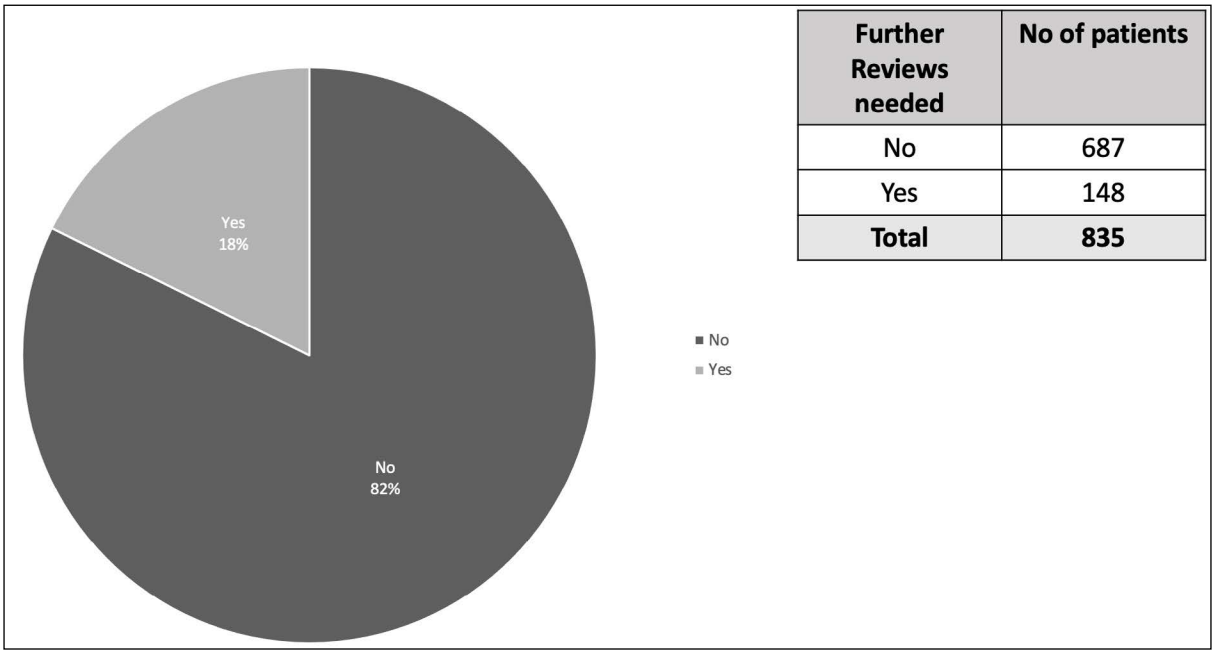
A large variety of presenting complaints are routinely encountered on an every-day basis at OES. The most commonly encountered presenting complaints (as can be noted in Table 2) were ocular foreign bodies, eye irritation, eye redness and eye discharge.

Table 2 - Commonest types of Ophthalmic Presenting Complaints

Types of Ophthalmic presenting complaints	Number of such complaints encountered
Foreign body	170
Eye irritation	112
Eye redness	97
Eye discharge	51
Trauma (direct injury)	49
Post-operative complications	47
Blurred vision	43
Eye floaters	41
Eye pain	36
Peri-orbital swelling	29
Visual disturbances	21
Eye flashes	17
Chalazion	14
Decrease in visual acuity	13
Herpes Zoster / Herpes Simplex	13

Vision loss	11
Increased lacrimation	10
Chemical injury	9
Headache	6
High IOP	7
Trichiasis;	4
Subconjunctival haemorrhage	4
Bell's Palsy	4
Photophobia	3
Eyelid twitching	2
Binocular diplopia	2
Recurrent uveitis	2
Diplopia	2
Eye check-up	2
Eye infection	1
Photosensitivity	1
Unequal pupils	1
Blurred vision and flashes	1
Eyelid swelling	1
Eye swelling	1
Eyelid drooping	1
Retinal haemorrhage	1
Transient decrease in vision	1
Optic disc swelling	1
Migraine with aura	1
Peri-Orbital Redness	1
CRVO	1
Headache and eye pain	1
GRAND TOTAL	**835**

Figure 6 outlines that a relatively minor proportion of all reviewed cases at OES required further ophthalmic review with the remaining being reviewed only once with no need for further reviews.



Further Reviews needed	No of patients
No	687
Yes	148
Total	**835**

Figure 6 - Ophthalmic Emergency Cases requiring further ophthalmic review

Table 3 gives an overview of the ophthalmic complaints requiring follow up at ophthalmic outpatients. Reasons for follow ups may include the need of a second opinion, the need for further specialised equipment or the monitoring of disease progress with treatment given.

Table 3 - Which ophthalmic presentations warranted further ophthalmic review

Types of Ophthalmic Conditions	Number requiring further Ophthalmic Review
Foreign body	28
Eye redness	21
Eye irritation	18
Trauma (direct injury)	12
Eye pain	8
Blurred vision	8
Post-operative complications	7
Eye discharge	6
Eye floaters	6
Visual disturbances	3
Subconjunctival haemorrhage	3
Chemical injury	3
Vision loss	3
Periorbital swelling	2
High IOP	2
Decrease in visual acuity	2

Bell's Palsy	2
Chalazion	2
Transient decrease in vision	1
CRVO	1
Photophobia	1
Eye lacrimation	1
Blurred vision and flashes	1
Increased lacrimation	1
Eye flashes	1
Trichiasis	1
Increase in IOP	1
Binocular diplopia	1
Herpes Zoster	1
Eyelid drooping	1
GRAND TOTAL	**148**

DISCUSSION

This study reveals significant gender and age disparities in OES utilization, with a majority of self-referrals, indicating potential gaps in primary care ophthalmic services.

Gender discrepancy

Figure 1 outlines the gender distribution of OES attendees at MDH. A male prevalence of attendees can be noted, which could be secondary, but not limited, to health seeking behaviour and occupational factors.

Regarding health seeking behaviour, research has proven men to be less likely to seek medical help for their ailments when compared to women, leading to an increased risk of male patients requiring emergency care over females (Galdas et al., 2005).

As to occupational factors, a percentage of the commonest ocular injuries (including corneal foreign bodies and abrasions) happen in the workplace. Moreover, the occupations harbouring the biggest risk for ocular injuries include welders, metalworkers, builders and farmers, all of which are male-dominated occupations (Kyriakaki et al., 2021).

Age discrepancy at different time sectors

It is clear from the obtained results (Figure 2) that the older population has a higher likelihood of attending OES in the morning, while the younger group tends to favour attendance in the afternoon, evening, or even at night. This could be attributed to the impact of work and daily routines on the patient's availability to attend OES.

The older population is more inclined to be in retirement, reducing the likelihood of additional commitments such as caring for young children or working regular office hours - as a result, they tend to seek OES in the morning, according to their rather more flexible schedules. In contrast, the younger population, often active in the workforce and managing various commitments, is less prone to seeking emergency assistance during morning hours.

Additionally, the older population demonstrated a higher likelihood of seeking healthcare compared to the younger groups (Adamson et al., 2008). This corelates with our findings of the average age of OES attendees being 50 years old.

Regional distribution

As can be seen on Figure 3, the majority of OES attendees originate from the south region of Malta (39%), followed by those from the central (36%), north (25%) and Gozo (less than 1%). The lowest OES attendance noted among Gozitans could be attributed to transportation/travel and accessibility to healthcare services.

Transportation barriers are essentially equivalent to healthcare barriers as they lead to reduced healthcare utilization (Syed et al., 2013). Residents of Gozo will find it extremely cumbersome to travel to Malta (especially at later times of the day) to make use of OES. This could explain the significant disparity in OES attendance between Gozitans and patients residing in Malta, as indicated by the results.

Because of its location in Malta, individuals from Gozo may experience limited accessibility to the OES at MDH, which could discourage Gozitan patients from seeking help there.

Furthermore, the results indicated that the majority of OES-seeking patients came from the south and central regions of Malta, with the north region slightly lagging behind. This difference may be attributed to:

- The higher population density in the south and central regions of Malta.
- An elevated usage of private healthcare in the north of Malta, resulting in lower utilization of public healthcare (Malta was found to have the fourth highest out-of-pocket spending for private medical care in the EU [Zammit, 2022]).

Recognizing this attendance gap is vital for brainstorming ways to enhance the OES and effectively reach underserved segments of the Maltese population, such as considering the provision of EOS in Gozo.

Discrepancy in nationality

Figure 4 outlines that 86% of patients were noted to be of Maltese origin whilst the remaining 14% were foreigners. The increasing percentage of foreign patients attending OES can be an indication of the progressively increasing foreign population in Malta. Moreover, it could also point towards increased healthcare inclusivity and accessibility. It is however important to keep in mind that even though a proportion of OES attendees are foreign, the majority of patients were still of Maltese origin. This observation itself may indicate a lack of awareness among the foreign population regarding accessibility to our healthcare system.

Sources of referral

As shown in Figure 5, the high rate of self-referrals suggests inadequate access to primary ophthalmic care. This finding underscores the crucial role of GPs and primary healthcare in assessing patients locally and guiding them to OES when needed. Despite the above, only a relatively small percentage of patients (15.5%) were referred to OES through health centers or GPs, with the majority (84%) choosing to directly present to the ED. Various reasons could account for this, including but not limited to the following:

- The elevated rates of self-referral highlight the population's heightened awareness of eye health and the significance of seeking prompt medical attention.
- Alternatively, the increase in self-referral rates may indicate community lack of awareness of the services offered at PHC, leading individuals to completely bypass it and directly seek assistance from the ED. Considering this perspective, dedicating additional resources to PHC could potentially decrease self-referrals to OES, thereby reducing the number of cases unnecessarily presenting at the hospital that could have been adequately managed at PHC.

Therefore, acknowledging this trend is crucial for optimizing resource allocation to PHC, with the goal of improving patient satisfaction and reducing the occurrences of self-referrals.

Moreover, as can be seen in Table 2, most common presenting complaints include foreign bodies, eye irritation and eye redness - which can be adequately managed in the PHC setting, should the latter have the necessary equipment

and training. This finding further highlights the need of providing more resources to PHC in order to increase patient satisfaction and ultimately reduce the load on OES.

Cases requiring further ophthalmic review

A significant discovery in the analysis revealed that the majority of patients seeking care at the OES - 82% - required further ophthalmic review, as seen in Figure 6, emphasizing the complexity of the cases encountered.

This observation sheds light on the intricate nature of ophthalmic diseases and the challenges associated with their treatment. It emphasizes the multifaceted aspects involved in addressing eye-related emergencies, indicating that a comprehensive and prolonged approach is often necessary for effective management.

Moreover, the fact that a substantial portion of cases require multiple reviews underscores the importance of having a dedicated OES and maintaining such specialized services. These services not only cater to the immediate needs of patients but also ensure ongoing and thorough care for complex ophthalmic conditions, thereby enhancing the overall quality and efficacy of eye healthcare provision.

In a similar study by Gavin, 2017, a total of 377,000 ophthalmic emergency room visits were examined over a 14-year period. It was noted that only about 25,300 (14.9%) of those cases actually required OES, with the rest being suitable for adequate management in non-emergency settings. This study went further to recommend ways of reducing attendance of non-emergent cases to OES, with the main strategy being creation of incentives for primary care providers and eye specialists to establish after-hours services. This was deemed to be beneficial for the younger or economically disadvantaged portions of population who may find difficulties taking time off for an eye appointment and may consequently opt to utilize OES during the night, even when their cases are non-emergent.

Moreover, Channa et al., 2016 once again identified a male preponderance to Ophthalmic ED attendees, with a larger percentage of non-emergent cases making up the case load – more than 4 million visits to the Ophthalmic ED had occurred between the years of 2006 and 2011 for non-emergent conditions such as conjunctivitis, subconjunctival haemorrhages and styes. This study further reinforced the importance of shifting as many of non-emergent cases towards community clinics/outpatient eye clinics. Such approach aids in optimizing resource allocation at the ED level, ensuring better healthcare provision for patients choosing community/ eye clinic reviews, timely care for those with truly emergent ophthalmic conditions, and an overall substantial reduction in healthcare costs (Channa, et al., 2016).

Limitations

The study's retrospective design may introduce selection bias, as data were only collected from one hospital, as well as seasonal bias which could result in skewed data due to holiday-related behaviors, travel patterns and other seasonal variations. Future research should include multiple centres over a longer period to enhance generalizability.

Data was gathered exclusively from one source – the government national hospital – omitting emergency ophthalmic referrals to private clinics. The time of registration at the ED may not precisely reflect the time of clinical review due to varying waiting times. Data collection was conducted over only one month, potentially limiting the representation of seasonal variations/ longer-term trends.

Many patients presented with overlapping and multiple complaints, often non-specific in nature, posing challenges in categorization and analysis. Emergency ophthalmic referrals for patients who were admitted to MDH were excluded from the study, potentially influencing the overall findings.

RECOMMENDATIONS

There is always room for improvement, and in the context of this retrospective demographic study, while acknowledging its generalizability limitation, the following recommendations can be taken into account for future research and practice enhancement.

Implementing a Continuous Quality Improvement (CQI) programme

Establishing a dedicated initiative within the OES with the goal of monitoring and improving the quality of care provided would have a positive impact on both OES at MDH and PHC. Additionally, conducting regular reviews and updates of protocols and standard operating procedures (SOPs) based on the insights gained from this demographic study and subsequent analyses would contribute to the overall improvement of OES functioning.

Establishing a clinical practice guideline

Guidelines, preferably in the short and visual form, should be created and disseminated amongst GP clinics and HCs, specifying ophthalmic emergency clinical presentations and management pathways (with a clear outline of which cases would warrant an MDH OES review and those only requiring an urgent outpatient appointment). The most common and non-complicated presentations such as foreign body, viral conjunctivitis or subconjunctival haemorrhage (which do not require specialist input) can potentially be managed in the community/PHC should the necessary guidelines be present.

Despite the need of the above-mentioned guidelines, further education regarding management of ocular emergencies should be provided to GP and PHC service workers. However, this needs to be part and parcel with providing quality basic ophthalmology equipment at all centres which is serviced regularly.

Increasing the time of clinical training in medical school

Currently the observation and exposure time in ophthalmology for medical students is limited to a one-week placement as per the curriculum, and is scheduled in most of the cases prior to the ophthalmology lectures. Earlier and more efficient clinical exposure of the future healthcare professionals should potentially improve the PHC management of ophthalmic emergencies and further decrease the workload on the MDH OES.

General population educational campaigns on eye health

Public awareness campaigns should be introduced, aiming to educate the community about common eye conditions, the importance of regular eye check-ups, and when to seek emergency eye care. Moreover, collaboration with primary healthcare providers in disseminating information on preventive measures should be one of the priority topics in improvement of the OES system in Malta

Implementing continuous analysis

The data collection period for this study should be extended in order to allow for a more extensive analysis of demographic trends and patterns of use of OES. Additionally, it may be worth analysing a broader range of demographic data such as socioeconomic status, employment status and education level. Paying attention to these groups of demographics will allow the researcher to highlight any patterns in the social determinants of ophthalmic health and thus improve the awareness and self-referral rates

One should also consider leveraging qualitative research methods, including interviews or focus groups, to investigate the patients' perspectives, experiences and any barriers they might encounter in utilizing OES. This approach aims to provide a richer and more nuanced understanding of the patient's journey and can offer valuable insights for further optimizing OES accessibility and effectiveness.

Implementing the aforementioned recommendations in future studies may contribute to achieving a more comprehensive understanding of the demographic data pertaining to patients utilizing OES. Furthermore, this proactive approach could enhance the

optimization of care delivery, ultimately leading to improved patient satisfaction and outcomes.

CONCLUSION

This retrospective demographic study offered valuable insights into the different characteristics of all patients accessing the OES at MDH over a 32-day period. This study successfully identified key demographic trends and referral patterns in Malta's OES, revealing critical areas for improvement in primary care ophthalmic services. However, the study's limited scope necessitates further research to confirm these findings and develop targeted interventions. By acknowledging these trends, it should become possible to allocate resources more effectively and target interventions to meet the diverse needs of the community. Overall, the aims and objectives of this study have been achieved throughout the data collection and analysis, while acknowledging its generalizability limitation.

Moving forward, the findings of this study can serve as a foundation for future research endeavours and quality improvement initiatives aimed at optimizing OES delivery at MDH and within the community. In conclusion, this study sheds light on numerous demographic trends among OES patients, providing a framework for enhancing the quality of service provided by OES and improving patient outcomes in the long term.

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