

Knowledge of medical students regarding pediatric surgery subspecialty, Mansoura Manchester medical program fresh graduates

Original Article

Mohamed Elsherbiny, Adham Elsaied, Momen Abdelgilil, Alaa Mohamed, Kawthar Shehab, Hesham Sheir, Abdelrahman Elshafey, Moustafa Elayyouti, Ahmad Elhattab, Mahmoud Elhadidi, Tamer Ashraf and Mohamed Elzebery

Department of Pediatric Surgery, Faculty of Medicine, Mansoura University, Mansoura, Egypt.

ABSTRACT

Background/purpose: Pediatric surgery topics are typically not included in the undergraduate programs of developing nations. The medical school curriculum can impact the career paths of future doctors. The objective of this research is to assess the understanding of recent medical graduates regarding pediatric surgery as a separate specialty.

Patients and Methods: A cross-sectional online survey study was conducted using a pretested online questionnaire which was distributed between Mansoura Manchester medical program fresh graduates over 3 months. The questionnaire recorded participants' socio-demographic details, their knowledge about the specialty of pediatric surgery, and their perception of the specialty.

Results: The study, involving 150 participants (43 males and 107 females), uncovered key insights into medical students' knowledge and perceptions of pediatric surgery. While 75% of students showed interest in the field, 25% did not. Deterrents included stress (noted by 41.1% of females and 14.0% of males) and the field's competitiveness (15.0% of females). The study also revealed significant knowledge gaps, with many students misattributing procedures like circumcision and inguinal hernia treatment to incorrect specialties. These findings highlight the need for improved educational efforts to better prepare students for careers in pediatric surgery.

Conclusion: Medical students at Mansoura Manchester Medical Program had a general awareness of pediatric surgery, but detailed knowledge varied by subspecialty. Higher GPAs and internships improved understanding, yet gaps remained in recognizing appropriate specialists for certain conditions. Deterrents to pursuing pediatric surgery included lack of interest, stress, long training, and competitiveness. Enhanced education and exposure are needed to ensure well-rounded competency among graduates.

Key Words: Career, clerkship, developing country, pediatric surgery subspecialty, undergraduate.

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Corresponding Author: Mohamed Elsherbiny, MD, Department of Pediatric Surgery, Faculty of Medicine, Mansoura University, Mansoura, Egypt. **Tel.:** +20 100 128 0040, **E-mail:** m_s_sherbiny@mans.edu.eg

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INTRODUCTION

The subspecialty of pediatric surgery is a critical area within the medical field, focusing on the surgical care of infants, children, and adolescents. Medical students' knowledge and understanding of pediatric surgery are vital for the effective diagnosis and referral of pediatric conditions. The findings from recent studies on the knowledge levels of medical students regarding pediatric surgery, highlight the influence of curriculum, clinical rotations, sex, academic performance, sources of information, and continuing education^[1,2].

Clinical rotations play a pivotal role in medical education by providing hands-on experience and direct exposure to specific medical fields. A 2019 study found that students who had completed a pediatric surgery

rotation performed significantly better in knowledge assessments compared with those who had not undergone such rotations. This suggests that practical experience in pediatric surgery is essential for improving students' understanding and retention of knowledge. Furthermore, integrating pediatric surgery topics into the core curriculum and offering interactive learning opportunities, such as simulation-based training, have been shown to enhance students' confidence and competence in this field^[3].

Pediatric Surgery is one of the most competitive surgical subspecialty fellowships, and candidates need to build a robust and research-focused resume. While some objective admission criteria are understood, there has not been a review of the factors for interview selection and program director ranking in over ten years^[4].

Pediatric surgical subjects are generally not included in the undergraduate curricula of developing countries. The career decisions of medical students are influenced by the curriculum and exposure they receive during medical school. While pediatric surgery is a relatively new surgical specialty, significant progress has been made in recent decades, particularly in workforce development and surgical care for children. The inclusion of pediatric surgery in undergraduate curricula has greatly improved overall surgical care for infants and has allowed pediatric surgeons to engage with undergraduates and generate interest in the specialty. Evaluating students' knowledge of and perceptions about a specialty like pediatric surgery is crucial for understanding its scope and for making career choices^[2,5].

PATIENTS AND METHODS:

Study design and ethical approval

A cross-sectional online survey study was conducted using a pretested online questionnaire that was distributed online between Mansoura Manchester medical program fresh graduates over a duration of 3 months using WhatsApp groups, Facebook groups, and direct connections. The questionnaire recorded participants' socio-demographic details, their knowledge about pediatric surgery, and their perception of the specialty.

A predesigned questionnaire was distributed online that includes 25 questions divided into three main domains. The first is participants' demographics including age, sex, place of residence, graduation year, academic GPA, and nationality. The second domain consisted of seven questions aimed at gauging the overall knowledge and perception of medical students about pediatric surgery. Students are asked to self-assess their knowledge about pediatric surgery and identify the primary sources from which they have learned about it. The questions also explore whether students had any exposure to pediatric surgery during their medical education and if they had the opportunity to participate in a pediatric surgery clerkship. Furthermore, students are asked for their opinions on pediatric surgery as a career specialty, their interest in pursuing it, and any factors that might deter them from choosing this specialty.

The third section presented five case scenarios designed to evaluate the knowledge of medical students regarding pediatric surgery referrals and procedures. These scenarios include questions about who should perform circumcisions on children, which specialist should be referred to for a child with an inguinal hernia, and which subspecialty should treat a female child with an ovarian cyst. Additionally, the scenarios assess the student's understanding of who should perform tonsillectomies on children and to whom they would refer a child with bladder exstrophy.

Exclusion criteria

Other medical students rather than Mansoura University.

Ethical consideration

The study protocol will be submitted for approval by the IRB. Confidentiality and personal privacy will be respected at all levels of the study. The data will not be used for any other purpose.

Statistical analysis

Data analysis was performed by SPSS software, version 26 (SPSS Inc., PASW statistics for Windows version 26). Chicago: SPSS Inc. Qualitative data were described using numbers and percentages. The significance of the obtained results was judged at the (≤ 0.05) level. χ^2 , Fisher exact test, and Monte-Carlo tests were used to compare qualitative data between groups as appropriate.

RESULTS:

Demographic characteristics of the studied medical students

The total number of participants is 150 medical students. The majority of the students (82.7%) are aged between 20 and 25 years, while the remaining 17.3% are aged between 26 and 30 years. In terms of sex distribution, 71.3% of the participants are female, and 28.7% are male. Most of the students (78%) are Egyptian nationals, with 22% being non-Egyptians. The participants are from two different graduation years: 70.7% are expected to graduate in 2023 and 29.3% in 2024. Regarding academic performance, 14% of the students have a GPA between 60 and 75, 27.3% have a GPA between 76 and 85, and the majority, 58.7%, have a GPA above 85. Additionally, 60.7% of the students have already started their internships, while 39.3% have not (Table 1).

Table 1: Demographic characteristics of the studied medical students

Demographics	N=150 (%)
Age	
20–25	124 (82.7)
26–30	26 (17.3)
Sex	
Males	43 (28.7)
Females	107 (71.3)
Nationality	
Egyptian	117 (78.0)
Non Egyptian	33 (22.0)

Graduation year	
2023	106 (70.7)
2024	44 (29.3)
Academic GPA	
60–75	21 (14.0)
76–85	41 (27.3)
>85	88 (58.7)
Started internship	
No	59 (39.3)
Yes	91 (60.7)

Assessment of the knowledge regarding specific pediatric surgery procedures

For a child with bladder exstrophy, most students chose a urologist (91.3%), followed by a pediatric surgeon (61.3%). In the case of a female child with an ovarian cyst, the majority selected a gynecologist (96%) and a pediatric surgeon (66%). For tonsillectomy in children, the predominant choice was an ENT specialist (97.3%). Regarding circumcision, the top choices were pediatric surgeons (83.3%) and general surgeons (63.3%). Lastly, for a child with an inguinal hernia, the students favored pediatric surgeons (83.3%) and general surgeons (72%) (Figs 1–5).

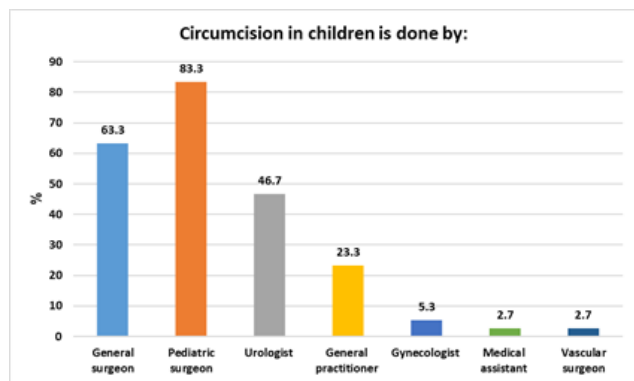


Fig. 1: Responders to circumcision question.

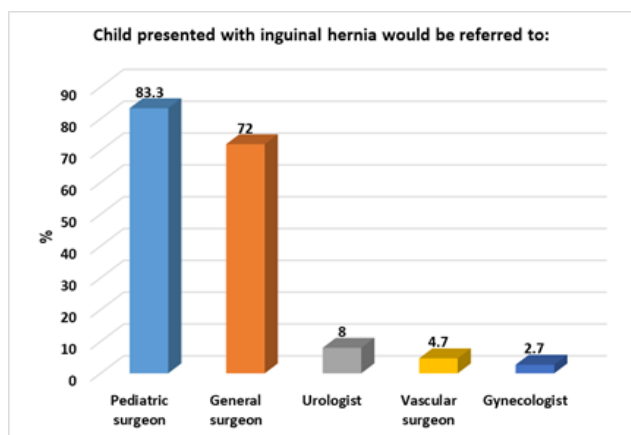


Fig. 2: Responders to inguinal hernia question.

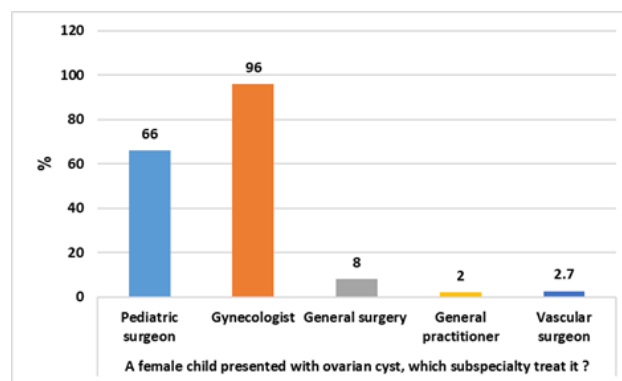


Fig. 3: Responders to ovarian cyst question.

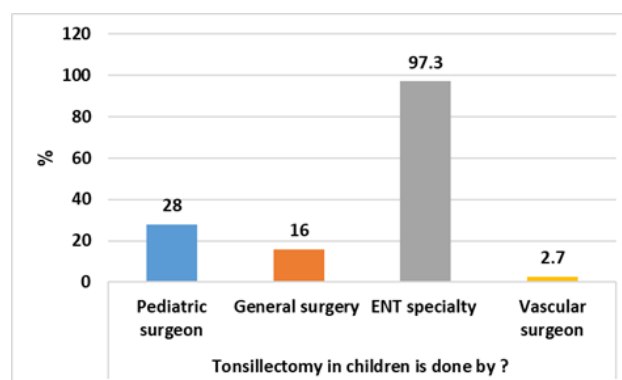


Fig. 4: Responders to tonsillectomy question.

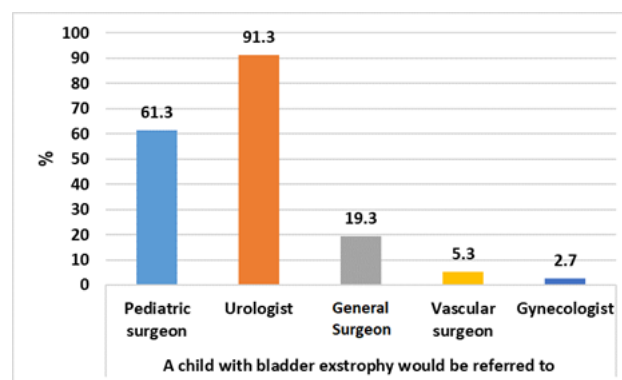


Fig. 5: Responders to Bladder exstrophy question.

The primary sources of information include clinical rotations (61.3%), the Internet (59.36%), teaching sessions (56%), books (38%), and friends (26.7%). When it comes to deterrent factors for pursuing a career in pediatric surgery, the most significant concern is interest in another career (72.7%), followed by stress (33.3%), long training times (30%), practical aspects (30%), and the competitive nature of the field (24.7%). Lesser factors include the difficulty of the specialty (19.3%), lifestyle considerations (22%), and a lack of interest in working with children (5.3%). These insights highlight the various influences and challenges perceived by medical interns in the field of pediatric surgery (Figs 6, 7).

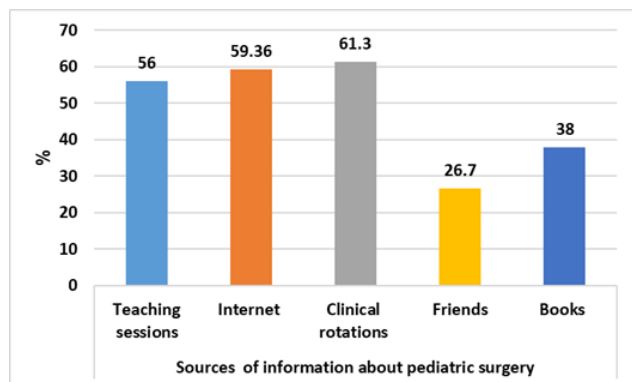


Fig. 6: Sources of information about pediatric surgery.

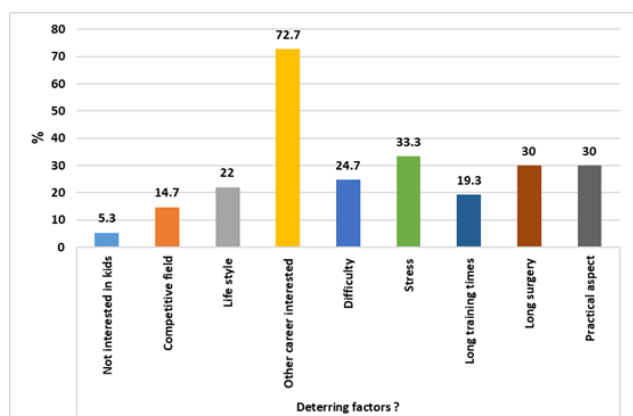


Fig. 7: Deterring factors.

Relationship between academic GPA and knowledge of pediatric surgery

By categorizing students into three GPA groups: 60–75, 76–85, and greater than 85. The table lists various specialists, such as general surgeons, pediatric surgeons, and urologists, and indicates how often students in each GPA group identify these specialists as responsible for performing circumcisions on children. Statistical tests, including the Monte–Carlo test and Fisher exact test, were used to determine the significance of the differences observed. For instance, students with a GPA of 60–75 were more likely to think that circumcisions are performed by general surgeons (100%) compared with those with higher GPAs, and this result was statistically significant ($P < 0.001$). Other findings include differences in the recognition of gynecologists and vascular surgeons performing the procedure, with varying levels of significance.

Relationship between sex and knowledge of pediatric surgery

A significant portion of students across all sexes correctly identified pediatric surgeons as the appropriate specialists for treating conditions like ovarian cysts

($P = 0.018$) and bladder exstrophy ($P = 0.028$). It also looks at the general perception of pediatric surgery as a specialty and the level of interest in pursuing it. A higher percentage of female students consider pediatric surgery essential ($P = 0.001$) and express interest in the specialty ($P = 0.042$). We also found the various sources from which students gain their knowledge about pediatric surgery and examine their perceived sufficiency. The sources include teaching sessions, the internet, clinical rotations, friends, and books. Statistical analysis shows significant differences in the reliance on and perceived sufficiency of these sources. For instance, teaching sessions were a major source of information for 95.1% of students with a GPA of 76–85, compared with 52.4% in the 60–75 GPA group ($P = 0.001$). Clinical rotations and books were also significant sources, with varying degrees of importance across GPA groups. The table further investigates whether students had sufficient exposure to pediatric surgery during their medical school rotations and whether the university provided adequate opportunities to learn about this specialty, with significant differences observed in the responses ($P = 0.03$ and $P = 0.029$, respectively).

Comparing the knowledge and perceptions of medical students regarding pediatric surgery, focusing on those who have started their internship versus those who have not, with key findings highlighted using statistical tests. For circumcision knowledge, 68.1% of interns recognize that general surgeons perform circumcisions compared with 55.9% of noninterns, though this is not statistically significant ($P = 0.130$). However, 89.0% of interns versus 74.6% of noninterns correctly identified pediatric surgeons ($P = 0.02$), and noninterns more often incorrectly identified general practitioners (44.1% vs. 9.9%, $P = 0.001$) and gynecologists (0% vs. 8.8%, $P = 0.019$). Regarding referral for inguinal hernia, 83.1% of noninterns would refer to a general surgeon compared with 64.8% of interns ($P = 0.015$), while 16.9% of noninterns versus 2.2% of interns incorrectly chose a urologist ($P = 0.001$). In managing ovarian cysts, both groups correctly identified gynecologists (96.6% noninterns, 95.6% interns, $P = 0.759$), but noninterns more often incorrectly chose vascular surgeons (6.8% vs. 0%, $P = 0.02$). For tonsillectomy, 40.7% of noninterns incorrectly believed pediatric surgeons performed the procedure compared with 19.8% of interns ($P = 0.005$), while nearly all students correctly identified ENT specialists ($P = 0.154$). Deterring factors for pediatric surgery included lack of interest in children, cited by 13.6% of noninterns versus none of the interns ($P = 0.001$), lifestyle (29.7% of interns vs. 10.2% of noninterns, $P = 0.005$), and stress (46.2% of interns vs. 13.6% of noninterns, $P = 0.001$). Long surgeries and practical aspects were also more frequently mentioned by interns as deterrents (37.4% each) compared with noninterns (13.6% each, $P = 0.015$) (Table 2).

Table 2: Relation between started internship and knowledge regarding pediatric surgery

	Started internship		Test of significance
	No N=59 (%)	Yes N=91 (%)	
Circumcision on children is done by			
General surgeon	33 (55.9)	62 (68.1)	$\chi^2=2.29$ $P=0.130$
Pediatric surgeon	44 (74.6)	81 (89.0)	$\chi^2=5.37$ $P=0.02^*$
General practitioner	26 (44.1)	9 (9.9)	$\chi^2=23.37$ $P=0.001^*$
Gynecologist	0	8 (8.8)	$\chi^2=5.48$ $P=0.019^*$
Medical assistant	4 (6.8)	0	$\chi^{2FET}=6.34$ $P=0.012^*$
Urologist	25 (42.4)	45 (49.5)	$\chi^2=0.720$ $P=0.396$
Vascular surgeon	4 (6.8)	0	$\chi^{2FET}=6.34$ $P=0.012^*$
A Child presented with inguinal hernia would be referred to?			
Gynecologist	0	4 (4.4)	FET=2.66 $P=0.103$
Urologist	10 (16.9)	2 (2.2)	$\chi^2=10.58$ $P=0.001^*$
General surgeon	49 (83.1)	59 (64.8)	$\chi^2=5.89$ $P=0.015^*$
Pediatric surgeon	46 (78.0)	79 (86.8)	$\chi^2=2.02$ $P=0.156$
Vascular surgeon	7 (11.9)	0	$\chi^2=11.32$ $P=0.001^*$
A female child presented with ovarian cyst, which subspecialty treat it?			
Pediatric surgeon	34 (57.6)	65 (71.4)	$\chi^2=3.04$ $P=0.081$
Gynecologist	57 (96.6)	87 (95.6)	FET=0.094 $P=0.759$
General surgery	6 (10.2)	6 (6.6)	$\chi^2=0.622$ $P=0.430$
General practitioner	3 (5.1)	0	FET=4.72 $P=0.059$
Vascular surgeon	4 (6.8)	0	FET=6.34 $P=0.02^*$
4- Tonsillectomy in children is done by?			
Pediatric surgeon	24 (40.7)	18 (19.8)	$\chi^2=7.75$ $P=0.005^*$
General surgery	13 (22.0)	11 (12.1)	$\chi^2=2.63$ $P=0.105$
ENT specialty	59 (100)	87 (95.6)	$\chi^2=2.6$ $P=0.154$
Vascular surgeon	4 (6.8)	0	FET=6.34 $P=0.02^*$
A child with bladder exstrophy would be referred to?			
Pediatric surgeon	37 (62.7)	55 (60.4)	$\chi^2=0.080$ $P=0.780$
Urologist	57 (96.6)	80 (87.9)	$\chi^2=3.42$ $P=0.064$
Pediatric surgery	16 (27.1)	13 (14.3)	$\chi^2=3.78$ $P=0.052$
Vascular surgeon	4 (6.8)	4 (4.4)	FET=0.403 $P=0.712$
Gynecologist	0	4 (4.4)	FET=2.66 $P=0.154$
How is your knowledge about pediatric surgery?			
Not at all	2 (3.4)	8 (8.8)	Mc=4.54 $P=0.103$
Little	57 (96.6)	79 (86.8)	
Excellent	0	4 (4.4)	
Teaching sessions	34 (57.6)	50 (54.9)	$\chi^2=0.104$ $P=0.746$
Internet	44 (74.6)	45 (49.5)	$\chi^2=9.6$ $P=0.002^*$
Clinical rotations	41 (69.5)	51 (56.0)	$\chi^2=2.73$ $P=0.099$
Friends	22 (37.3)	18 (19.8)	$\chi^2=5.61$ $P=0.018^*$
Books	24 (40.7)	33 (36.3)	$\chi^2=0.296$ $P=0.586$
Have any exposure to pediatric surgery during medical school	39 (66.1)	47 (51.6)	$\chi^2=3.06$ $P=0.08$
Rotations	23 (54.8)	17 (33.3)	$\chi^2=4.32$ $P=0.038^*$

KNOWLEDGE OF PEDIATRIC SURGERY SUBSPECIALITY

Mentors	9 (21.4)	0	$\chi^2=12.09$ $P=0.016^*$
Lectures	35 (83.3)	40 (78.4)	$\chi^2=0.355$ $P=0.552$
The experience been sufficient			$\chi^2=1.42$ $P=0.234$
No	38 (66.7)	40 (56.3)	
To some extent	19 (33.3)	31 (43.7)	
Had the chance to have a pediatric surgery clerkship	7 (11.9)	5 (5.5)	$\chi^2=1.97$ $P=0.160$
Is the chance provided by the university sufficient to give you the chance to learn more about pediatric surgery?			
No	36 (64.3)	46 (55.4)	$\chi^2=1.09$ $P=0.578$
yes	16 (28.6)	30 (36.1)	
To some extent	4 (7.1)	7 (8.4)	
5- What do you think of pediatric surgery as a specialty?			
Essential	37 (62.7)	61 (67.0)	$\chi^2=0.295$ $P=0.587$
Like any other specialty	22 (37.3)	30 (33.0)	
6- Are you interested in pediatric surgery?			
NO	46 (78.0)	66 (72.5)	$\chi^2=0.560$ $P=0.454$
YES	13 (22.0)	25 (27.5)	
7- Deterring factors?			
Not interested in kids	8 (13.6)	0	$\chi^2=13.03$ $P=0.001^*$
Competitive field	12 (20.3)	10 (11.0)	$\chi^2=2.50$ $P=0.114$
Life style	6 (10.2)	27 (29.7)	$\chi^2=7.93$ $P=0.005^*$
Other career interested	44 (74.6)	65 (71.4)	$\chi^2=0.179$ $P=0.673$
Difficulty	15 (25.4)	22 (24.2)	$\chi^2=0.03$ $P=0.862$
Stress	8 (13.6)	42 (46.2)	$\chi^2=17.11$ $P=0.001^*$
Long training times	15 (25.4)	14 (15.4)	$\chi^2=2.31$ $P=0.128$
Long surgery	11 (13.6)	34 (37.4)	$\chi^2=5.97$ $P=0.015^*$
Practical aspect	11 (13.6)	34 (37.4)	$\chi^2=5.97$ $P=0.015^*$

χ^2 , Chi-Square test; FET, Fisher exact test; MC, Monte–Carlo test.
*statistically significant.

DISCUSSION

Although pediatric surgery is a relatively young specialty within the field of surgery, substantial progress has been made in recent decades^[6,7], particularly in the areas of workforce development and the provision of surgical care for children. Incorporating pediatric surgery into undergraduate medical education has led to considerable enhancements in overall surgical care for infants and has provided pediatric surgeons with the opportunity to engage with undergraduates, encouraging interest in this specialized field^[5]. All British universities, except Oxford and Cambridge, have a department on child health. The General Medical Council of the UK has recommended pediatric surgery be included in a structured undergraduate curriculum^[2].

15 Canadian medical schools were surveyed, revealing that students have minimal scheduled teaching hours for pediatric surgery (an average of 7 h

total), and only 25% of graduates go on to a pediatric surgery clerkship. Given the increasing focus on congenital malformations, pediatric trauma, neonatal and fetal surgery, and pediatric oncology, pediatric surgery needs to receive the recognition it deserves as a distinct specialty in its evaluation^[6,8,9].

The majority of medical students at Mansoura Manchester Medical Program had a general awareness of pediatric surgery, yet their detailed knowledge was inconsistent and varied by subspecialty. Those students with higher academic GPAs and those who had started internships showed better understanding, particularly in recognizing which specialties perform specific procedures. Despite this, there were notable gaps, such as confusion over which specialists handle certain conditions like ovarian cysts or inguinal hernias in children. Deterrents to pursuing pediatric surgery include a lack of interest in pediatrics, perceived stress, long training times, and the competitive nature of the field. Studies have indicated that the selection

of a surgical specialty by undergraduate students may be impacted by a variety of factors. These include sex, age, marital status, the influence of prestige, mentoring by established surgeons, career prospects, intellectual stimulation, and the experience gained during clinical clerkships^[10–14].

The demographic characteristics of the studied medical students reveal that most (82.7%) are between 20 and 25 years old, with a smaller proportion (17.3%) aged 26–30. A significant majority (71.3%) of the participants are female. Regarding academic performance, 58.7% have a GPA above 85, 27.3% have a GPA between 76 and 85, and 14% have a GPA between 60 and 75. Additionally, 60.7% of the students have started their internship, while 39.3% have not. There is a noticeable relationship between academic GPA and knowledge of pediatric surgery. Students with a lower GPA (60–75) significantly believe that circumcision is done by a general surgeon, while those with higher GPAs lean towards pediatric surgeons or urologists. Most students, regardless of GPA, refer children with inguinal hernia to general or pediatric surgeons. Gynecologists are predominantly chosen to treat ovarian cysts across all GPA groups. ENT specialists are overwhelmingly preferred for tonsillectomy, with urologists most commonly chosen for bladder exstrophy. There is a significant difference in self-reported knowledge based on GPA, with students with higher GPAs reporting better knowledge. Teaching sessions and clinical rotations are significant sources of information for those with higher GPAs.

Sex differences also play a role in the knowledge of pediatric surgery. Female students significantly believe that circumcision is done by general surgeons more than male students do. Both sexes mainly refer inguinal hernia cases to general and pediatric surgeons. Female students favor gynecologists for treating ovarian cysts, while males significantly consider general surgeons. ENT specialists are preferred by both sexes for tonsillectomy, though there are differences in the choice of general surgery. Both sexes prefer urologists for bladder exstrophy, with no significant difference. Female students report higher knowledge levels and more frequently cite teaching sessions, friends, and books as sources of information. They also show more interest in pediatric surgery compared with male students, with notable differences in factors like interest in children, career preferences, and stress levels.

For a child with bladder exstrophy, most students chose a urologist (91.3%), followed by a pediatric surgeon (61.3%). In the case of a female child with an ovarian cyst, the majority selected a gynecologist (96%) and a pediatric surgeon (66%). For tonsillectomy in children, the predominant choice was

an ENT specialist (97.3%). Regarding circumcision, the top choices were pediatric surgeons (83.3%) and general surgeons (63.3%). Lastly, for a child with an inguinal hernia, the students favored pediatric surgeons (83.3%) and general surgeons (72%). These answers suggest that many medical students overlook the need for a multidisciplinary approach in treating complex pediatric conditions, which often require collaboration among various specialists. Various areas where internship experience appears to significantly influence knowledge and perceptions regarding pediatric surgery. These differences underline the importance of practical experience in shaping medical students' understanding and career interests.

CONCLUSION

The majority of medical students at Mansoura Manchester Medical Program displayed a general awareness of pediatric surgery, but their detailed knowledge was inconsistent and varied by subspecialty. Students with higher academic GPAs and those who had begun internships demonstrated better understanding, particularly in identifying which specialties perform specific procedures. However, notable gaps persisted, such as confusion about which specialists manage conditions like ovarian cysts or inguinal hernias in children. Deterrents to pursuing pediatric surgery included a lack of interest, perceived stress, extended training durations, and the competitive nature of the field. To address these issues, curriculum developers should integrate targeted pediatric surgery modules into the medical program, emphasizing the correct identification of surgical specialties and subspecialties. Additionally, providing early and consistent exposure to pediatric surgery through clinical rotations and mentorship could reduce misconceptions and alleviate deterrents. Implementing workshops focused on stress management and career planning might also help mitigate concerns about the demands and competitiveness of the specialty, ultimately leading to a more well-rounded and prepared cohort of graduates.

Acknowledgments

Limitations of the study: This study is limited by its cross-sectional design, reliance on self-reported data, and a focus on a single medical program, which may not reflect broader trends in pediatric surgery awareness among medical graduates in other regions or programs.

ABBREVIATIONS

CT, computed tomography; MRI, magnetic resonance imaging; UDT, undescended testis; US, ultrasound.

CONFLICT OF INTEREST

There are no conflicts of interest.

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