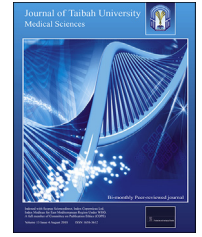




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Original Article

### Awareness of common paediatric orthopaedic problems among paediatricians and family medicine physicians

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#### المخلص

**أهداف البحث:** معظم مشاكل العظام للأطفال التي يتم إحالتها إلى أطباء جراحة عظام الأطفال عادة ما تكون محدودة ذاتياً، وتحتاج إلى المراقبة والتطمين. وقد يكون ارتفاع توقعات الوالدين هو سبب ارتفاع معدلات الإحالة. أجريت هذه الدراسة لتقييم الإدراك والمعرفة حول التشخيص والعلاج لبعض المتغيرات الطبيعية الشائعة لنمو عظام وعضلات الأطفال بين أطباء الأطفال وأطباء الرعاية الصحية الأولية.

**طرق البحث:** تم توزيع استبيان ذاتية (تم اختبار صلاحيتها وموثوقيتها) في الفترة ما بين نوفمبر ٢٠١٦ و يونيو ٢٠١٧. من بين ٣٠٠ استبانة وزعت، تم الحصول على ١٨٩ (٦٣٪ معدل الاستجابة) وكانت من ١٠٦ طبيب أطفال، و ٥٧ طبيب أسرة، و ٢٦ طبيباً عاماً.

**النتائج:** شكل أطباء الأطفال ٥٦٪ من المشاركين، في حين أن ٣٠.٢٪ كانوا أطباء أسرة، و ١٣.٨٪ كانوا أطباء عامين. تراوحت الإجابات الصحيحة بين ٩٪ و ٦٦.١٪. ووجدنا معرفة غير كافية فيما يتعلق بمشاكل العظام الشائعة لدى الأطفال عند ٨٧.٣٪ من المشاركين. مع إصرار الوالدين، أحال ٧٥.٧٪ من الأطباء الحالة بغض النظر عن الحاجة، بينما سجلت الإحالات غير المناسبة للخوف من القضايا القانونية الطبية ٦٢.٤٪. وأظهرت الدراسة أن أطباء الأطفال كانوا أقل عرضة لتحويل غير المناسب بالمقارنة مع أطباء الأسرة والأطباء العامين (٦٧٪ مقابل ٨٧.٧٪، و ٨٤.٦٪ على التوالي).

نسبة الأطباء الذين ذكروا أنهم تلقوا أكثر من ١٠٪ من التدريب بطب العظام كانوا أكثر احتمالاً لتحويل حالات العظام بشكل غير ملائم مقارنة مع أولئك الذين ذكروا نسبة تدريب أعلى (٨٢.١٪ مقابل ٦٦.٧٪).

**الاستنتاجات:** الإحالات غير المناسبة إلى أطباء جراحة عظام الأطفال أخذت في الازدياد. وتشير النتائج بوضوح إلى الحاجة إلى زيادة التعلم عن العظام والعضلات خلال المرحلة الجامعية وفترة التدريب في التخصص لطب الأطفال وطب الأسرة. كما ينبغي تنفيذ المبادئ التوجيهية الحديثة وتحديثها بانتظام. يجب النظر في المواد التعليمية للوالدين (ملصقات، أشرطة الفيديو، وما إلى ذلك).

**الكلمات المفتاحية:** طب الأطفال؛ طب العظام؛ العضلات والعظام؛ الإحالة غير المناسبة

#### Abstract

**Background:** Most paediatric orthopaedic problems referred to paediatric orthopaedists are usually self-limited, requiring observation and reassurance. Higher parental expectations may have resulted in higher referral rates. This study was conducted to assess awareness and knowledge about the diagnosis and management of some common normal variants of musculoskeletal paediatric development among paediatricians and primary health care physicians.

**Method:** A self-administered questionnaire (tested for validity and reliability) was distributed between November 2016 and June 2017. Of 300 questionnaires, 189 (63% response rate) were obtained from 106 paediatricians, 57 family physicians, and 26 general practitioners (GPs).

**Results:** Paediatricians accounted for 56% of participants, 30.2% were family physicians, and 13.8% were GPs. Correct answer rates ranged between 9% and 66.1%. Inadequate knowledge of common paediatric orthopaedic problems was found in 87.3% of participants. With parental insistence, 75.7% of physicians referred a case, regardless of necessity, whereas

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inappropriate referral for medicolegal issues was reported by 62.4%. The study showed that paediatricians were less likely than family physicians and GPs to refer inappropriately (67% versus 87.7% and 84.6%, respectively;  $p = 0.007$ ). Physicians who reported that more than 10% of their training was in orthopaedics were more likely to inappropriately refer orthopaedic cases compared to those who reported a higher percentage of orthopaedic training (82.1% versus 66.7%).

**Conclusion:** Inappropriate paediatric orthopaedic referrals are increasing. The results clearly point to the need for increased musculoskeletal education during undergraduate medical and residency training in paediatrics and family medicine. New guidelines should be implemented and updated regularly. Educational material for parents (posters, videos, etc.) should be considered.

**Keywords:** Inappropriate referral; Musculoskeletal; Orthopaedics; Paediatrics

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## Introduction

Musculoskeletal problems are common in the general population,<sup>1</sup> and are becoming a fundamental part of primary care medicine. Schwend and Geiger reported that about 33% of childhood medical problems were related to the musculoskeletal system.<sup>2</sup> Primary care physicians usually diagnose and manage healthcare problems that do not need subspecialty care rather than referring to specialists and consultants. Over-referral seems to have increased in the past few years.<sup>3</sup> A study published in the USA in 2012 showed that from 1999 to 2009, the incidence of patient referrals doubled from 4.8% to 9.3%, indicating a huge increase in the referral rate from 40.6 million to 105 million cases per year.<sup>4</sup> A study conducted in the UK found that 42.7% of referrals were inappropriate. A study by Carli showed that 22.5% of physiological conditions were mistakenly referred, while flat foot, intoeing, and genu varum/valgum showed referral rates that exceeded 40%.<sup>5</sup> A high referral rate may indicate a lack of either examination skills or basic knowledge.<sup>6</sup> On the other hand, the large proportion of referrals is not necessarily inappropriate. Instead, they may indicate the patient's desire to consult a certain specialist.<sup>7</sup> Inappropriate referrals are time-consuming and money wasting and prolong the time until a patient is seen by the physician, causing anxiety and frustration for the patient and his family, straining hospital resources, and increasing the workload for the physician, thereby delaying care for appropriate referrals.<sup>8</sup> It has been thought that developing consensus referral guidelines might help general practitioners make more effective use of hospital services.<sup>9</sup> However, an evaluation of the impact of orthopaedic guidelines on referrals from primary care physicians to a

speciality department concluded that the provision of written referral guidelines to general practitioners (GPs) does not affect the pre-referral management of patients or the overall number of referrals to the specialist.<sup>10</sup> A study done in KSA to assess management of low back pain (LBP) by primary care practitioners and referral patterns to spine surgeons found high referral and mismanagement rates, influenced by both lack of implementation of clinical practice guidelines and lack of awareness of spine surgery.<sup>11</sup> Therefore, this study was conducted to assess the awareness and basic knowledge of the diagnosis and management of some common normal variants of musculoskeletal paediatric development (intoeing, physiological varus, and flat foot) among paediatricians and primary care physicians.<sup>12</sup> Unfortunately, parental general knowledge of these conditions is limited or absent, making them a common source of parental concern and referral to paediatric clinics.<sup>13</sup> Hence, primary care providers must be able to distinguish between normal and abnormal conditions prior to referral for specialist evaluation.<sup>14</sup> It is usually possible to diagnose normal variants and exclude pathological conditions based on history and clinical examination alone.<sup>15</sup> Radiological and other investigations are not routinely required (except when a pathological condition cannot be excluded). Spontaneous resolution of an abnormality is the outcome in the majority of cases, and no treatment is recommended.<sup>16,17</sup> However, surgery may be considered in some patients (severe cases or in children greater than 8 years old). It is essential to educate and reassure parents as a part of treatment.<sup>18</sup> The purpose of this study was to determine the reasons for inappropriate referrals to general orthopaedists, and to assess factors that might affect physician knowledge, such as current employment, place of training, or previous experience, in an attempt to identify areas that could be improved in undergraduate and postgraduate training programs in paediatrics and family medicine.

## Materials and Methods

The study was approved by the research ethics board of Umm Al-Qura University and the questionnaire was designed to assess the awareness of common paediatric orthopaedic problems. This instrument contained multiple-choice questions about 3 selected common conditions noted above, and was evaluated for content validity by experts in the field of paediatric orthopaedics. A group of 22 paediatricians and family physicians (other than those included in the study) completed the questionnaire on two separate occasions, 4 weeks apart, demonstrating good reliability (0.84).

Paediatricians and family physicians (GPs, residents, specialists, and consultants) were recruited. The questionnaire was distributed manually in all nearby hospitals, while an online form was sent to those who were out of reach. The questionnaire survey was conducted between November 2016 and June 2017. The anonymous self-administered questionnaire collected personal data and factors that may affect the awareness of common paediatric orthopaedic problems. Of more than 300 copies distributed, 189 responses were obtained from 106 paediatricians, 57 family physicians, and 26 GPs.

### Statistical analysis

Knowledge questions were evaluated such that correct answers were given a score of “1”, whereas incorrect or “do not know” answers were given a score of “0”. Total scores and percentages were computed. Those who scored below 60% were considered as having “inadequate knowledge”, whereas those who scored 60% or more were considered as having “adequate knowledge”. Data were presented as a frequency and percentage. The chi-square test was utilized to test for the association between categorical variables. Fisher’s exact test was applied for sample sizes <5. A P-value <0.05 was used as a cut-off for statistical significance. All analyses were performed using SPSS, version 22.

### Results

The study included 189 physicians. Table 1 summarizes baseline characteristics. More than half (56%) were paediatricians, whereas 30.2% and 13.8% were family physicians and GPs, respectively. Consultants represented 16.4%, whereas 37.5% were residents. Only 17.5% reported attending any orthopaedic conference/course, whereas 14.8% had elective training in orthopaedics (undergraduate/postgraduate training). The percentage of musculoskeletal or orthopaedic cases in training program educational activity exceeded 10% among 40.9% of the participants.

Physicians answered 13 questions regarding common paediatric orthopaedic problems, with correct answer rates ranging between 9% and 66.1%. Overall, inadequate knowledge regarding common paediatric orthopaedic problems was reported by most participants (87.3%).

Consultants had more adequate knowledge regarding common paediatric orthopaedic disorders (32.3%) than specialists (16.3%), general practitioners (6.8%), and residents (5.6%). The difference was statistically significant,  $p = 0.001$ . Other factors such as speciality, the percentage of

musculoskeletal or orthopaedic training, attending any orthopaedic conference/course, and having elective training in orthopaedics (under/postgraduate training) were not significantly associated with knowledge (Table 2).

Inappropriate orthopaedic referral at parental request was reported by 75.7% of physicians, whereas inappropriate referral for medicolegal reasons was reported by 62.4%.

Table 3 shows that paediatricians were less likely to inappropriately refer orthopaedic cases compared to family physicians and general practitioners (67% versus 87.7% and 84.6%, respectively;  $p = 0.007$ ). Physicians who reported that more than 10% of their training included musculoskeletal or orthopaedic cases were more likely to inappropriately refer orthopaedic cases compared to those who reported a higher percentage (82.1% versus 66.7%;  $p = 0.045$ ). Physicians who attended any orthopaedic conference/course tended to inappropriately refer orthopaedic cases, in contrast with those who did not attend such conferences/courses (87.9% versus 73.1%). However, this difference was borderline insignificant,  $p = 0.052$ .

Table 3 also demonstrates that consultants were less likely to inappropriately refer orthopaedic cases for medicolegal reasons, compared to specialists, GPs, and residents (35.5% versus 65.1%, 77.3%, and 64.3%, respectively;  $p = 0.003$ ). Physicians who reported that more than 10% of their training was in musculoskeletal or orthopaedic cases were more likely to inappropriately refer orthopaedic cases for medicolegal reasons, compared to those who reported a higher percentage (71.4% versus 53.7%;  $p = 0.037$ ). Physicians who had adequate knowledge of common paediatric orthopaedic disorders were less likely to inappropriately refer orthopaedic cases for medicolegal reasons compared to those who had inadequate knowledge (33.3% versus 67.1%). This difference was statistically significant ( $p = 0.001$ ).

### Discussion

Inappropriate referral leads to a large consumption of time and paediatric orthopaedic resources, resulting in a delayed referral of more appropriate patients. We aimed to determine the causes for these inappropriate referrals, by evaluating the level of understanding of common normal lower limb variants in children. Matzkin reported that a cognitive examination of musculoskeletal medicine was distributed among 334 participants consisting of medical students, residents, and staff physicians. The results showed that 79% of the participants failed the basic musculoskeletal cognitive examination.<sup>19</sup> Our study likewise found that 87.3% of participants had inadequate knowledge, while (12.7%) had adequate knowledge based on the questionnaire results. This suggests that training in musculoskeletal medicine is inadequate in both medical school and non-orthopaedic residency training programs. According to Pinney and Regan, there is a marked discrepancy between necessary skills and knowledge needed to treat patients with musculoskeletal conditions, as determined by a survey of primary care physicians, and the amount of time devoted to teaching these skills in Canadian medical schools.<sup>20</sup> Of 141 family medicine practitioners, 27.4% reported that their practice involved musculoskeletal

**Table 1: Baseline characteristics of the participants (n = 189).**

	Frequency	Percentage
<b>Speciality</b>		
Paediatrics	106	56.0
Family medicine	57	30.2
General practitioner	26	13.8
<b>Title</b>		
Consultant	31	16.4
Specialist	43	22.8
General practitioner	44	23.3
Resident	71	37.5
<b>Percentage of musculoskeletal training and educational activity (n = 137)</b>		
≤10%	81	59.1
>10%	56	40.9
<b>Attended any orthopaedic conference/course</b>		
No	156	82.5
Yes	33	17.5
<b>Elective training in orthopaedics</b>		
No	161	85.2
Yes (average of 4 weeks)	28	14.8

**Table 2: Factors associated with physician knowledge regarding common paediatric orthopaedic problems.**

	Knowledge		$\chi^2$	p-value
	Inadequate	Adequate		
	N = 165	N = 24		
	N (%)	N (%)		
<b>Speciality</b>				
Paediatrics (n = 106)	94 (88.7)	12 (11.3)	1.976	0.372
Family medicine (n = 57)	47 (82.5)	10 (17.5)		
General practitioner (n = 26)	24 (92.3)	2 (7.7)		
<b>Title</b>				
Consultant (n = 31)	21 (67.7)	10 (32.3)	15.764	0.001
Specialist (n = 43)	36 (83.7)	7 (16.3)		
General practitioner (n = 44)	41 (93.2)	3 (6.8)		
Resident (n = 71)	67 (94.4)	4 (5.6)		
<b>Percentage of musculoskeletal or orthopaedic training and educational activity (n = 137)</b>				
≤10 (n = 81)	68 (84.0)	13 (16.0)	0.079	0.778
>10 (n = 56)	48 (85.7)	8 (14.3)		
<b>Attended any orthopaedic conference/course</b>				
No (n = 156)	137 (87.8)	19 (12.2)	0.217	0.641
Yes (n = 33)	28 (84.8)	5 (15.2)		
<b>Elective training in orthopaedics</b>				
No (n = 161)	143 (88.8)	18 (11.2)	2.260	0.133
Yes (n = 28)	22 (78.6)	6 (21.4)		

disorders, yet <3% of all curricular hours in the typical Canadian medical school are devoted to musculoskeletal education.<sup>21</sup> This reinforces our assumption that the lack of clinical exposure and little or no theoretical exposure of musculoskeletal disorders in medical school or residency

programs is the reason why those who reported that more than 10% of their training was in musculoskeletal disorders were more likely to inappropriately refer orthopaedic cases, compared to those who reported a higher percentage.

**Table 3: Factors associated with inappropriate orthopaedic referrals among the participants.**

	Inappropriate referral due to parental request		$\chi^2$	p-value	Inappropriate referral for medicolegal reasons		$\chi^2$	p-value
	No	Yes			No	Yes		
	N = 46	N = 143			N = 71	N = 118		
	N (%)	N (%)			N (%)	N (%)		
<b>Speciality</b>								
Paediatrics (n = 106)	35 (33.0)	71 (67.0)	9.969	0.007	45 (41.9)	61 (58.1)	4.590	0.101
Family medicine (n = 57)	7 (12.3)	50 (87.7)			21 (36.8)	36 (63.2)		
General practitioner (n = 26)	4 (15.4)	22 (84.6)			5 (19.2)	21 (80.8)		
<b>Title</b>								
Consultant (n = 31)	4 (12.9)	27 (87.1)	6.699	0.082	20 (64.5)	11 (35.5)	14.006	0.003
Specialist (n = 43)	12 (27.9)	31 (72.1)			15 (34.9)	28 (65.1)		
General practitioner (n = 44)	7 (15.9)	37 (84.1)			10 (22.7)	34 (77.3)		
Resident (n = 71)	23 (32.4)	48 (67.6)			25 (35.7)	45 (64.3)		
<b>Percentage of musculoskeletal or orthopaedic training and educational activity (n = 137)</b>								
≤10 (n = 81)	27 (33.3)	54 (66.7)	4.023	0.045	37 (46.3)	44 (53.7)	4.329	0.037
>10 (n = 56)	10 (17.9)	46 (82.1)			16 (28.6)	40 (71.4)		
<b>Attended any orthopaedic conference/course</b>								
No (n = 156)	42 (26.9)	114 (73.1)	0.052 <sup>a</sup>		58 (36.8)	98 (63.2)	0.080	0.777
Yes (n = 33)	4 (12.1)	29 (87.9)			13 (39.4)	20 (60.6)		
<b>Elective training in orthopaedics</b>								
No (n = 161)	42 (26.1)	119 (73.9)	2.133		62 (38.1)	99 (61.9)	0.365	0.546
Yes (n = 28)	4 (14.3)	24 (85.7)			9 (32.1)	19 (67.9)		
<b>Knowledge about common paediatric orthopaedic problems</b>								
Inadequate (n = 165)	39 (23.6)	126 (76.4)	0.348	0.555	55 (32.9)	110 (67.1)	10.198	0.001
Adequate (n = 24)	7 (29.2)	17 (70.8)			16 (66.7)	8 (33.3)		

<sup>a</sup> Fisher's exact test.

Inadequate knowledge most likely will lead to a low level of confidence and will affect decision-making and judgment, making such physicians more likely to inappropriately refer patients. This could explain why doctors with inadequate knowledge were more likely to refer patients for medicolegal reasons. In fact, Jandial found that self-rated confidence in paediatric musculoskeletal (pMSK) management was low compared with that for other body systems; most respondents were confident “in most aspects” or “very confident” in management of cardiovascular, respiratory, and abdominal disorders, while for pMSK, the majority had “no” or “some” confidence (21% and 53%, respectively).<sup>22</sup> Inappropriate orthopaedic referral at parental request was reported by 75.7% of physicians. Roland et al. reported that 20% of cases referred by GPs were the result of pressure by the family.<sup>9</sup> In this case, inappropriate referral may not reflect the lack of physician training and experience, as many physicians refer patients when they feel that the child’s family is not satisfied with care. In addition, the inability to consult a colleague is another cause of inappropriate referral, as colleagues strengthen each other’s resolve and self-confidence. Thus, regular staff meetings may lead to fewer referrals.<sup>23</sup>

One of the limitations of this study is the questionnaire itself, despite validation by clinicians who are experts in educational testing. False-positive results can be randomly obtained as there is a high likelihood of providing a correct answer to a multiple-choice question. Even though this was not a perfect questionnaire, the responses illustrate the marked discrepancy between practical issues that physicians face and their knowledge regarding these issues. Another limitation is the sample. Although it included paediatricians, family physicians, and GPs from all grades (considered a strength in this study), all were from major hospitals in major cities. We anticipate a higher number of inappropriate referrals among physicians in remote areas.

### Strengths

A validated questionnaire was used and the number of participants was acceptable.

### Weakness

The outcomes were predictable with regard to inadequate knowledge and medicolegal issues.

### Conclusion

Inappropriate paediatric orthopaedic referrals are increasing, and represent substantial unnecessary cost to the healthcare system. The results clearly point to the importance and necessity of teaching undergraduates and medical students about common paediatric orthopaedic problems in order to ensure appropriate referrals. This study also highlighted the importance of continuing medical education.

### Recommendations

The latest guidelines should be implemented in all primary care centres/hospitals and updated regularly.

Educational material for parents (posters, videos, etc.) should be considered as well. Promotion of a cooperative culture among physicians in the Kingdom should encourage research. Regulations should be implemented to reassure physicians who are worried about medicolegal issues.

More research is needed to identify other possible reasons for inappropriate referral. More attention to communication skills is needed, to reassure parents in benign cases, and to reduce the rate of referral due to parental insistence.

### Conflict of interest

The authors have no conflict of interest to declare.

### Authors’ contributions

SF conceived and designed the study, conducted research, and provided research materials, MHF, AMF, LMA, and SB collected and organized data, interpreted and analysed data, wrote initial and final drafts, and provided logistic support. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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