



## Research article

## Female genital mutilation: Survey of paediatricians' knowledge, attitudes and practice



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## ABSTRACT

The study objective was to determine paediatricians' experience with female genital mutilation (FGM) in Australian children and adolescents. A cross-sectional, pilot-tested national survey of paediatricians practising in Australia and contributing to the Australian Paediatric Surveillance Unit was conducted. Clinicians' knowledge, attitudes and clinical experience with FGM, awareness of clinical guidelines and education/training needs were recorded. Of 1311 paediatricians surveyed, 497 (38%) responded. Fifty-seven percent were aged 50 years or more, and 51.3% were males. Over half believed that FGM was performed in children in Australia and most were aware of its complications, but few asked about or examined for FGM. Fifty (10.3%) had seen at least one case of FGM in girls aged <18 years during their clinical career, including 16 (3.3%) in the past 5 years. Most were aware that FGM is illegal in Australia (93.9%), agreed all types of FGM were harmful (97.4%) and agreed that FGM violated human rights (98.2%). Most (87.6%) perceived FGM as a traditional cultural practice, although 11.6% thought it was required by religion. The majority (81.8%) knew notification of FGM to child protection authorities was mandatory. Over half (62.0%) were aware of the WHO Statement on FGM, but only 22.0% knew the WHO classification of FGM. These novel data indicate a minority of paediatricians in Australia have clinical experience with or education about FGM. Educational programs, best-practice clinical guidelines and policies are required to address knowledge gaps and help paediatricians identify, manage and prevent FGM in children.

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## 1. Introduction

Female genital mutilation (FGM) is defined by the World Health Organisation (WHO), as the partial or total removal of the external genitalia, or other injury to the female genital organs for non-medical reasons. FGM is generally performed in girls under 15 years of age (World Health Organisation, 2008).

In 2008, the WHO estimated that between 100 and 140 million girls and women living worldwide have undergone FGM and that three million are at risk of FGM every year in Africa alone (World Health Organisation, 2008). In 2016, the United Nations International Children's Emergency Fund (UNICEF) estimates that at least 200 million girls and women have undergone FGM, and the greatest prevalence of FGM among girls aged under 14 years is reported in Gambia (56%), Mauritania (54%) and Indonesia (~50%) (United Nations Children's Fund, 2016). FGM is practised in 29 countries in Africa, the Middle East and Asia (United Nations Children's Fund, 2013). Many migrants from these countries settle in Europe, the United Kingdom, North America and Australasia. In 2011, estimates from the Australian Bureau of Statistics indicated that more than 109,000 women and girls living in Australia originated from countries where FGM is traditionally practised (Family Planning Victoria, 2014).

FGM may have serious adverse short and long term impacts on health and well-being and is considered a violation of the human rights of the child (World Health Organisation, 1999). FGM is illegal in many countries including Australia, North America, UK and throughout Europe. Although, there is no federal legislation on FGM in Australia, six of the eight States and Territories currently legislate against the practice of FGM (Mathews, 2011).

Although many high-income countries are home to large numbers of immigrants from countries where FGM is practiced, limited information is published on FGM in children and adolescents in these societies.

In a recent UK study of 17 girls with FGM, the procedure was done by a healthcare professional in 71.0%, none in the UK (Hodes, Armitage, Robinson, & McCreighton, 2015). In a systematic literature review by our group we showed that knowledge, attitudes and practice regarding FGM among paediatricians had seldom been studied anywhere in the world (Zurynski, Sureshkumar, Phu, & Elliott, 2015). In a survey of 385 of members of the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), clinicians reported that they knew or suspected that FGM is performed in Australia and New Zealand (Moeed & Grover, 2012). Thus, Australian clinicians must be alert to FGM and have access to the knowledge and expertise required to provide specialised care.

Following a national workshop on FGM convened by the Australian Government Department of Health in 2013 we successfully tendered for a research project on FGM in children and adolescents. The aim of our study was to conduct a national survey through the Australian Paediatric Surveillance Unit, to document Australian paediatricians' knowledge, attitudes and clinical practice regarding FGM in children and adolescents and to understand their educational needs.

## 2. Methods

### 2.1. Definition

In accordance with the WHO (World Health Organisation, 2008), we defined FGM as the partial or total removal of any or all of the external genitalia, or other injury to the female genital organs (including cutting, piercing, stretching, cauterisation, scraping and infibulation), that was performed for non-medical reasons. Elective cosmetic procedures including labioplasty and piercing were excluded.

### 2.2. Participant recruitment

All child health specialists ( $N = 1340$ ), predominantly paediatricians (71%) who are in child health practice and regularly contribute to national surveillance of rare diseases (He, Zurynski, & Elliott, 2009) conducted by the Australian Paediatric Surveillance Unit (APSU) were invited to complete a once only survey on FGM between April and June 2014. An email with a link to an online survey was sent; 200 requested a paper questionnaire. Twenty-nine on extended leave were excluded, leaving 1311 eligible participants. Non-responders were sent three reminders at three-weekly intervals. Following this, we sought limited data from the remaining non-responders to determine whether or not they had seen any cases of FGM in their practice in the last five years (see appendix, question 17).

### 2.3. Questionnaire development

The self-administered questionnaire was designed in consultation with a working group of expert clinicians from the disciplines of general paediatrics, child protection, obstetrics and gynaecology. The founder of African Women Australia (2014) was a member of the working group. The questionnaire was piloted for acceptability, content and clarity by ten paediatricians from different specialities at the Sydney Children's Hospitals Network (Westmead). The survey was amended according to feedback.

The final survey requested de-identified information in five domains: clinician demographics; awareness of and attitudes to FGM; clinical practice regarding FGM; knowledge of policies and guidelines about FGM; and training and access to educational resources.

## 2.4. Statistical analysis

Data were analysed using the SAS (version 9.1.3) statistical software program. The number of valid responses is reported in the tables; missing responses were excluded. The year of award of Fellowship of the Royal Australasian College of Physicians (RACP), the credentialing body for paediatricians in Australia and New Zealand, or equivalent, and the number of children seen in a typical week, were grouped into categories. Descriptive statistics are presented as count and percentage for discrete variables and as mean and standard deviation or median and interquartile range for quantitative variables. For responses using Likert scales, the categories of *strongly agree* and *tend to agree* were collapsed into *agree* and *strongly disagree* and *tend to disagree* were collapsed into *disagree*.

## 2.5. Ethics approval

The study was approved by the Human Research Ethics Committee of the Sydney Children's Hospitals Network (Westmead).

## 3. Results

### 3.1. Sample characteristics

Completed surveys were returned by 497 (37.9%) paediatricians. Over half were aged over 50 years, 51.3% were male, and almost half practiced in New South Wales (Table 1). Half (50.3%) were general paediatricians, some with a specialty interest, 40.8% were paediatric sub-specialists, 8.5% were specialists including paediatric surgeons or urologists and two were obstetrician/gynaecologists who worked with children. Most (71.0%) were in hospital-based practice and had trained

**Table 1**  
Characteristics of reporting paediatricians.

Variable	N = 497	(%)
Gender		
Male	255	51.3
Female	242	48.7
Age (years)		
<35	4	0.8
35–49	209	42.2
50–64	217	43.8
≥65	65	13.2
State of practice		
New South Wales	221	44.7
Victoria	94	19.0
Queensland	90	18.1
Western Australia	44	8.9
South Australia	37	7.5
Northern Territory	5	1.0
Tasmania	4	0.8
Speciality		
General paediatrician	204	41.2
Paediatric sub-specialist	202	40.8
General with speciality interest	45	9.1
Obstetrics and Gynaecology	2	0.4
Other	42	8.5
Practice type		
Hospital-based	346	71.0
Community-based	141	29.0
Country of medical training		
Australia	344	70.2
Overseas	91	18.6
Both	55	11.2
Year of award of FRACP/FRACGP or equivalent		
1960–1979	51	10.6
1980–1999	219	45.4
≥2000	212	44.0
Number of children seen in a typical week		
<20	96	20.0
20–30	163	33.9
31–50	150	31.2
>50	72	14.9

**Table 2**  
Paediatricians' awareness of and attitudes to FGM.

Attitudes and awareness	Agree		Disagree		Unsure	
	N	(%)	N	(%)	N	(%)
All types of FGM are harmful	482	(97.4)	5	(1.0)	8	(1.6)
All types of FGM are illegal in Australia	463	(93.9)	5	(1.0)	25	(5.1)
FGM is a violation of human rights	483	(98.2)	3	(0.6)	6	(1.2)
In some cultural groups FGM is a traditional practice	431	(87.6)	25	(5.1)	36	(7.3)
FGM is a required by religion	57	(11.6)	281	(57.0)	155	(31.4)
FGM is performed in children in Australia	295	(60.0)	34	(6.9)	163	(33.1)
FGM is performed overseas in children who are residents of Australia	357	(73.9)	12	(2.5)	114	(23.6)
Notification of FGM to child protection services is mandatory	399	(81.8)	7	(1.4)	82	(16.8)

**Table 3**  
Paediatricians' knowledge of policy and guidelines about FGM.

	Not aware N (%)	Aware N (%)	Aware of and read N (%) <sup>a</sup>	Aware, read and used N (%) <sup>a</sup>
RACP-DPCH <sup>a</sup> Female Genital Mutilation cutting policy	250 (51.2)	238 (48.8)	57 (23.9)	6 (2.5)
RACP-DPCH <sup>a</sup> Genital Examination in Girls and Young Women: A clinical practice guideline	288 (59.0)	200 (41.0)	39 (19.5)	15 (7.5)
WHO statement on Female Genital Mutilation	184 (38.0)	300 (62.0)	36 (12.0)	7 (2.3)
Family Planning Victoria National resource on FGM	431 (90.7)	44 (9.3)	5 (11.4)	4 (9.1)

<sup>a</sup> Percentage denotes the proportion of paediatricians who were aware of the policy or guidelines and read, or read and used.

in paediatrics in Australia, and 44.0% received their specialist qualification (Fellowship of the RACP or equivalent) after 2000 (Table 1). As over 90.0% of our sample comprised paediatricians, we will refer to the group of respondents as paediatricians.

### 3.2. Attitudes and awareness

Almost all clinicians agreed that all types of FGM are harmful (97.4%), illegal (93.9%) and a violation of human rights (98.2%) (Table 2). Most (87.6%) agreed that FGM is a traditional practice in some cultural groups, but over 11% believed that the practice of FGM is required by religion. More than half (60.0%) agreed that FGM is performed in children in Australia and 73.9% agreed that it is performed overseas in children who are residents of Australia. Most (81.8%) knew that notification of FGM to child protection services is mandatory in Australia. Paediatricians indicated that FGM was most likely to be practised in Africa (96.0%) the Middle East (60.0%) and Asia (15.0%).

### 3.3. Knowledge about FGM policy and clinical guidelines

Almost half the paediatricians (48.8%) were aware of the Female Genital Mutilation Cutting Policy of the RACP Discipline of Paediatrics and Child Health (RACP-DPCH) (The Royal Australasian College of Physicians, 2012). Of these, 23.9% had read it and 2.5% had read it and used it in their practice. Of the 41.0% of paediatricians who were aware of the RACP Clinical Practice Guideline for Genital Examination in Girls and Young Women (The Royal Australasian College of Physicians, 2009) only 7.5% had read and used it in clinical practice (Table 3). Over half the paediatricians were aware of the WHO Statement on FGM (World Health Organisation, 2008) but only 2.3% had used it. Only 22.0% were aware of the WHO classification of the four FGM types (World Health Organisation, 2008). Few (9.1%) were aware of Family Planning Victoria's National Resource on FGM (Family Planning Victoria, 2014).

### 3.4. Clinical practice regarding FGM

Most clinicians reported that they never (69.5%) or rarely (22.9%) ask about FGM when taking a medical history in their paediatric patients. Those who asked very often or always ( $n = 3$ ) included one paediatrician who worked in refugee health. Only 5.0% always look for FGM during the clinical examination (Table 4).

Fifty (10.3%) of paediatricians had seen at least one child or adolescent with FGM during their entire clinical career and 16 (3.3%) had seen at least one in the last 5 years (a total of 59 cases). Of these 16 clinicians, five were in general paediatric practice and six were sub-specialists. Two paediatricians had a special interest in refugee health and one in child protection and forensics, one was an obstetrician/gynaecologist and one a paediatric urologist. Of the 814 non-responders, 416 provided

**Table 4**  
Australian paediatricians' practice regarding FGM.

Variable	N	(%)
Ask about FGM when taking a medical history		
Never	340	(69.5)
Rarely	112	(22.9)
Sometimes	34	(7.0)
Very often	2	(0.4)
Always	1	(0.2)
Look for FGM during clinical examination		
Never	195	(40.5)
Rarely	158	(32.9)
Sometimes	81	(16.8)
Very often	23	(4.8)
Always	24	(5.0)
Have ever seen a child who had undergone FGM?	50	(10.3)
Have seen a child who has undergone FGM in the last 5 years?		
Initial respondents to the survey	16	(3.3)
Additional respondents to the survey	7	(1.7)
Have ever been approached by anyone for advice about where to have FGM done?	3	(0.6)
Aware of the WHO classification of FGM?	106	(22.0)
Aware of any short term complications of FGM?	379	(77.4)
Infection	224	(45.1)
Problems related to urinary tract	194	(39.0)
Pain	133	(26.8)
Problems related to sexual health	127	(25.6)
Bleeding	106	(21.3)
Psychological problems	68	(13.7)
Scarring	63	(12.7)
Believe there are long-term consequences of FGM for health and well-being?	439	(90.5)
Problems related to sexual health	115	(23.1)
Psychological problems	101	(20.3)
Infertility/obstetric problems	27	(5.4)

a minimum dataset indicating whether or not they had seen cases of FGM without completing the full survey. Seven (1.7%) of these clinicians reported having seen at least one case in the past 5 years (a total of 19 cases). When combined with data from the original group of respondents, a total of 23 (2.3%) of 1003 paediatricians had seen at least one child with FGM in their practice in Australia in the last five years, a total of 78 cases.

Ten (2.1%) of the 497 respondents reported that they had been approached for advice about where they could have FGM done in Australia. Three paediatricians had been asked by a family to perform FGM. Most (77.4%) were aware of short term complications of FGM. Almost all (90.5%) believed that there are long term consequences of FGM for health and well-being.

### 3.5. Training and education about FGM

Only 15% of paediatricians had had some training in FGM, 7.0% of which was self-directed learning. A few (3.0%) reported that they had had other training and education through courses/conferences on child protection or sexual assault (Table 5). Most said that they would like to receive educational materials on FGM for themselves (64.8%) and their patients (50.1%). About half said that each of the following educational resources would be helpful: information resources for patients/parents e.g. fact sheets; guidelines on asking patients about FGM; guidelines on genital examination, recognition and classification of FGM in children and young people; referral pathways for patients with FGM (Table 5). They also wanted information about Australian law, their obligations under this law, and training about the cultural context of FGM (Table 5). Some clinicians commented that FGM should be included in training programs for general practice, paediatrics, child protection, and women's and sexual health and that educational materials should be evidence-based, accessible online and available to patients/parents as well as health professionals.

### 3.6. Effect of age, gender and overseas training on knowledge and attitudes about FGM

There were no significant differences in knowledge or attitudes towards FGM between paediatricians who were trained in Australia or overseas. A greater proportion (91.4%) of paediatricians aged  $\geq 50$  years believed that FGM is a traditional practice among some cultures, compared with their younger colleagues (82.6%,  $\text{Chi}^2 = 12.5$ ,  $P < 0.01$ ). Similarly a greater proportion of older paediatricians (81.2%) were aware of the short-term complications compared with younger paediatricians (72%,  $\text{Chi}^2 = 5.76$ ,  $P < 0.05$ ). Females were more likely to be aware of the WHO Statement on FGM (67.4% vs 53.7%;  $\text{Chi}^2 = 9.66$ ,  $P < 0.01$ ), the WHO classification of FGM (28.6% vs 15.5%;  $\text{Chi}^2 = 12.0$ ,  $P < 0.001$ ) and the Family Planning Victoria resource on FGM (10.6% vs 6.6%;  $\text{Chi}^2 = 6.18$ ;  $P < 0.5$ ). Females were also more aware of the short-term complications of FG than males (84.2% vs 70.8%;  $\text{Chi}^2 = 12.5$ ;  $P < 0.001$ ).

**Table 5**  
Paediatricians' training and education about FGM.

Question	Yes N (%)
Have you ever had any training or education about FGM?	71 (14.5)
Undergraduate medical training? <sup>a</sup>	7 (1.4)
Post graduate medical education	34 (6.9)
Self-directed learning activities	35 (7.0)
Specialist training	9 (1.8)
Specific courses	15 (3.0)
Child protection courses	9 (2.0)
Sexual assault courses	2 (0.4)
Would you like to receive educational materials for yourself?	315 (64.8)
Would you like to receive educational materials for patients?	244 (50.1)
What kinds of educational resources would help you most in dealing with FGM? <sup>a</sup>	
Information resources for patients/parents e.g. fact sheets	278 (55.9)
A guide to asking patients about FGM	245 (49.9)
A guide to genital examination for health professionals	230 (46.3)
A guide to recognition and classification of FGM in children and young people	284 (57.1)
Outline of Australian law and obligations of health professionals	284 (57.1)
Information about the cultural context of FGM	260 (52.3)
A guide for referral of patients with FGM	263 (52.9)
Other	8 (1.6)
None	54 (10.9)
Would you be interested in an evidence-based educational module for FGM?	270 (55.9)
Would you like to have input into the development of such a module?	27 (5.6)
Would you be interested in receiving a list of special services with expertise in FGM?	271 (56.6)

<sup>a</sup> Respondents could choose one or more options.

#### 4. Discussion

This cross-sectional study provides the first systematically collected national data on the knowledge, attitudes and practice regarding FGM among Australian paediatricians, and the first such data internationally. Of clinicians surveyed, one in ten had seen at least one child or adolescent with FGM during their clinical career, and 3% had seen one in the past 5 years. Our recent systematic literature review identified no studies that specifically focussed on paediatricians' knowledge, attitudes and practice (Zuryński et al., 2015). In a Spanish study which included paediatricians in the sample and analysed them separately, 16% had seen FGM in their practice, slightly more than in Australia (Kaplan-Marcusan, Toran-Monserrat, Moreno-Navarro, Castany Fabregas, & Munoz-Ortiz, 2009). Most Australian paediatricians were aware that all types of FGM are harmful, violate human rights, and are illegal in Australia and subject to mandatory notification to child protection services. Most paediatricians perceived FGM as a traditional practice in some cultures, but 12% incorrectly believed FGM is required by some religions.

Although more than half the respondents in our study knew about the WHO statement on FGM, only 22% knew about the WHO classification of FGM. In contrast (55%) of Spanish paediatricians were aware of the WHO classification of FGM (Kaplan-Marcusan et al., 2009). Almost half of the paediatricians in our study were aware of the RACP-DPCH Female Genital Mutilation Cutting Policy (The Royal Australasian College of Physicians, 2012) and clinical guidelines on genital examination in children (The Royal Australasian College of Physicians, 2009) but few had read these, and fewer had used them in clinical practice. This identifies the need to raise awareness of these guidelines.

Paediatricians in our sample rarely asked about FGM or looked for FGM during clinical examination. More than half of the clinicians believed that FGM was performed in Australia, and about 74% believed it was performed overseas on Australian children; a few had been asked to perform FGM or provide advice about where it could be performed. These results are consistent with those of Hodes et al. who recently reported that in over two thirds of cases seen in a safeguarding clinic in the UK, FGM had been performed by a medical practitioner or health professional in a medical setting, but none were confirmed to have been done in the UK (Hodes et al., 2015). The RANZCOG reported that some obstetricians/gynaecologists suspected that FGM was being performed in Australia (Moeed & Grover, 2012). In a Swedish sample of clinicians, that included paediatricians but did not analyse their responses separately, 5% had been asked to perform FGM or advise where it could be performed (Tamaddon, Johnsdotter, Liljestrånd, & Essen, 2006).

The medicalisation of FGM, where a doctor or another health professional performs the procedure has been condemned by the WHO, as it legitimises the practice (World Health Organisation, 2008).

Clinician knowledge, attitudes and practice differ markedly between Australia and some countries where FGM is highly prevalent. In an Egyptian sample that included paediatricians, most clinicians had knowledge about Type II FGM and reported this was the type most commonly performed in children (Refaat, 2009). Nearly 20% of these clinicians had themselves performed FGM and 35% had observed complications. Despite this, 18% supported continuation of FGM for religious or cultural reasons and some supported re-infibulation to prevent women being ostracised in their community (Refaat, 2009). Some stated that if performed, FGM should be performed by a clinician in a clinical setting, and over one third did not



World Health Organisation (2008). Eliminating Female genital mutilation: An interagency statement Available from: <a href="http://apps.who.int/iris/bitstream/10665/43839/1/9789241596442_eng.pdf">http://apps.who.int/iris/bitstream/10665/43839/1/9789241596442_eng.pdf</a>
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**Fig. 1.** Selected FGM resources relevant to paediatricians and other child health clinicians (Canadian Paediatric Society, 2014; FGM Education Programme for the New Zealand Ministry of Health, 2011; Her Majesty's Government, 2014; World Health Organisation, 2008; The Royal Australasian College of Physicians, 2009; The Royal Australasian College of Physicians, 2012).

approve of legislation banning FGM in Egypt (Refaat, 2009). In another study from Egypt, all health professionals surveyed, including paediatricians, believed that FGM was prescribed by religion. Although 66% knew about the complications of FGM, 48% supported the practice for their daughters and 28% had a daughter who had undergone FGM (Rasheed, Abd-Allah, & Yousef, 2011).

Australian paediatricians identified gaps in education: only 14.5% reported undertaking any training about FGM. A higher proportion of female paediatricians had knowledge of the WHO classification system, the short-term complications of FGM, relevant policies and resources on FGM, than male paediatricians. When compared with older paediatricians, fewer of those aged <50 years were aware of the WHO classification and fewer believed that FGM was a traditional practice in some cultures. Two-thirds of all respondents (64.8%) wanted to receive educational materials for themselves and for their patients (50.1%). These results support the development and wide distribution of educational resources and guidelines for paediatricians, with potential targeting of to younger, male paediatricians. We also need to raise awareness among Australian paediatricians, of current relevant resources (Fig. 1).

Our findings are similar to a Swedish study which showed that only one fifth of clinicians had adequate knowledge about FGM and few fully understood the cultural, social or religious basis for FGM (Tamaddon et al., 2006). Studies from Spain and Sweden also recognised the need for education and training for clinicians (Kaplan-Marcusan et al., 2009; Tamaddon et al., 2006). Clinicians in some UK women's health clinics report they are well trained in recognising and managing FGM and some have access to clinical staff with special expertise in FGM (Purchase et al., 2013), however, the level of training among UK paediatricians is unknown.

Although an estimated 90% of practising Australian paediatricians are listed on the APSU contact database from which our sample was drawn, the main limitation of this study was the potential for bias due to the low response rate (38%). Assuming that paediatricians who don't know or don't care about FGM were less likely to complete the survey, our data might be an overestimate of knowledge among Australian paediatricians. Nevertheless, we have complete, high quality data from a nationally representative sample of 497 paediatricians and we have additional data from 416 paediatricians who provided information on whether or not they had seen cases of FGM in children in the last 5 years. The response rate compares favourably with previous similar studies of clinicians' knowledge and attitudes to FGM (Zurynski et al., 2015). Our study

provides new insights into paediatricians' knowledge, attitudes and practice regarding FGM in Australia. Furthermore, our data are unique internationally and provide a baseline for comparative international and subsequent Australian studies.

## 5. Conclusions and recommendations

Approximately 10% of Australian paediatricians have looked after a child with FGM. Paediatricians need easy access to educational opportunities and tools, to enable them to provide appropriate care. Furthermore, they need guidance in recognising children at risk of FGM and culturally sensitive training to enable advocacy against the practice of FGM among families and communities. Australian guidelines should be updated and better disseminated among paediatricians and other child health professionals (*The Royal Australasian College of Physicians, 2009, 2012*). Paediatricians also need information about FGM law and a clear understanding of their legal obligations. Most importantly, referral pathways need to be established and publicised in Australia to enable children and their families to receive appropriate health care, including psychological support. An integrated, inter-agency, inter-sectoral policy is needed in Australia to prevent FGM.

## Competing interests

None declared.

## Contributor's statements

Elizabeth Elliott and Yvonne Zurynski conceived and designed the study, wrote the grant application, contributed to questionnaire design, data collection and interpretation and revision of the paper. Premala Sureshkumar designed the survey instrument, monitored data collection, cleaned and performed statistical data analysis, drafted and revised the manuscript. Susan Moloney, Shanti Raman and Nesrin Varol contributed to the study and questionnaire design, interpretation of data and revision of the paper.

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## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.chiabu.2016.03.005](https://doi.org/10.1016/j.chiabu.2016.03.005).