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Prevalence and factors associated with infectious intestinal diseases in Ras Al Khaimah, United Arab Emirates, 2017: A population-based cross-sectional study

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ABSTRACT

Background: The United Arab Emirates (UAE) is a rapidly developing high-income country that has experienced significant population growth, urbanization, and improvements in the standard of living since its formation in 1971. Published estimates on the prevalence of infectious intestinal diseases (IID) in the UAE are scarce and exclusively based on hospital data. The aim of this study was to provide the first prevalence estimates of IID in the UAE.
Methods: A population-based cross-sectional study design using a telephone-based questionnaire was used to estimate the IID prevalence in the previous 4 weeks in a representative sample of the Ras Al Khaimah (RAK) population from January to September 2017.
Results: Data were collected from 1254 participants (57.3% male; 25.2% <18 years). The prevalence of IID was 4.2% in the 4 weeks prior to the interview. Multivariate logistic regression analysis identified that being female (odds ratio (OR) 2.4, 95% confidence interval (CI) 1.2–5.1) and having a middle-range monthly household income (approx. USD 4080–<6800: OR 5.42, 95% CI 1.15–25.48; approx. USD 6800–<9530: OR 7.13, 95% CI 1.47–34.57) were positively associated with IID. Age ≥6 years was negatively associated with IID (OR 0.95, 95% CI 0.90–0.99). Forty-nine percent of participants with an IID sought medical care and 20.8% took over-the-counter medication.
Conclusions: This study provides the first population-based prevalence estimates of IID in the UAE, which are similar to those reported in China (4%), but lower than those reported in Canada (10%), the Netherlands (7%), and the USA (6%).

Introduction

Infectious intestinal disease (IID), defined as diarrhoea or vomiting due to pathogenic microorganisms, has been associated with significant morbidity and economic costs (Doorduyn et al., 2012). In many cases, the mild-to-moderate severity of IID, the self-limiting prognosis, and the difficulty of accessing healthcare for some people, has led to a lack of detection by traditional surveillance systems (Chen et al., 2013). Community-based surveys have been used to fill this gap and obtain a more realistic estimate of the burden of intestinal disease.

In developed countries, the reported prevalence of IID in the community has varied from 3.2% in Malta (Gauci et al., 2010) to 10.0% in Canada (Majowicz et al., 2004). There are a limited number of community studies on IID in the Gulf region, the majority of which have focused on parasites. For example, nearly half (44.2%) of the study sample in Madinah in the Kingdom of Saudi Arabia (KSA; Imam et al., 2015) and more than a third (34.8%) of the study sample in Bahrain were infected with parasitic infections (Mukhtar, 1995). However, a significantly lower prevalence was reported from Qatar (10.2%; Abu-Madi et al., 2010) and the emirate of Sharjah in the United Arab Emirates (UAE; 7.7%) (Dash et al., 2010).

Currently, there is a dearth of population-based research on the prevalence and factors associated with IID in the Gulf region. To our

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knowledge, there are only two published studies reporting population-based IID estimates for the Gulf region. In KSA, a school-based study recruited a random sample of male children (n = 1064; age 7–12 years) from public schools in the city of Jeddah during the winter (October 2004 to February 2005): the 1-month incidence of diarrhoea was 14.2 cases per 100 children and the prevalence of IID was 14.9% (Al-Ghamdi et al., 2009). The only previously conducted study in the UAE reported prevalence estimates for bacterial intestinal diseases and used secondary data from hospital records submitted to preventive medicine services and communicable disease departments in Dubai from 1995 to 2013 (Khamis and Hussain, 2015). The study reported annual crude incidence rates (CIR) of selected intestinal infections such as amoebic dysentery (mean CIR 4.55 per 100 000 per year), bacillary dysentery (mean CIR 4.95 per 100 000 per year), and salmonellosis (mean CIR 10.95 per 100 000 per year) from hospital records in the Emirate of Dubai for 19 different years (Khamis and Hussain, 2015).

There have been no population-based surveys using representative samples that have attempted to estimate the prevalence of IID in the UAE. The aim of this study was to estimate the prevalence of IID in a representative population-based sample from the emirate of Ras Al Khaimah (RAK) in the UAE.

Materials and methods

Study design and setting

A population-based telephone survey (cross-sectional design) was conducted from January 7, 2017 to September 30, 2017 in the emirate of RAK, UAE. This study was reviewed and approved by the Social Sciences Ethics Committee of the United Arab Emirates University (reference number ERS_2015_3207).

Participants and study size

The target population was all residents living in the emirate of RAK during the study period. All households in RAK are required to have an active landline and/or mobile telephone number registered to their residential address. The UAE Federal Competitiveness and Statistics Authority provided the sampling frame, which was a list of all residential addresses and telephone numbers in RAK. The study population was sampled from the target population stratified by geographical region and nationality group. Stratification by geographical region was performed using the 108 residential areas that divide RAK and ensured that the study population had proportional representation from all areas. Stratification by nationality group was conducted by categorizing participants as being from the UAE (national) or from any other country (non-national). The study sample was compiled using proportional allocation.

Using data from a previous study (Imhoff et al., 2004), it was estimated that the prevalence of IID in the past 4 weeks would be approximately 6% in this study. Therefore, a sample of 959 would provide an estimated population prevalence of between 4.5% and 7.5% with 95% confidence. Previous research in the emirate of Sharjah (UAE) in 2001 used a telephone survey and reported a 65% response rate (Al Tajir et al., 2006). A more conservative response rate of approximately 50% was assumed. The UAE Federal Competitiveness and Statistics Authority provided a list of 1728 residences with a mobile number for the head of the household, stratified by geographical location and nationality.

Recruitment method

According to the culture of the UAE, it was anticipated that most of the numbers for the residential head of household would belong to an adult male. The family and social hierarchical structure in the UAE national population is that the head of the household is usually male and the telephone number and billing is usually linked to a male head of the household (Abdulla et al., in press).

In order to recruit a representative sample of female subjects and children into the study sample, it was aimed to recruit one male, one female, and one child from each household. For example, if a male respondent answered the telephone call, then his spouse (or other adult female if a spouse was not available) and a child were recruited into the study. The next birthday method was used to select one child (<18 years) from each household. Considering the unique family and social hierarchical characteristics of the study population, it was expected that this recruitment method would at least provide a representative study sample that comprised male adults, female adults, and children.

Procedures

All information was collected through a telephone-based interview whereby trained research personnel called potential participants; once consent was obtained, the researcher proceeded to go through the questionnaire to collect the information. The questionnaire was developed in three languages: Arabic, English, and Urdu. All versions were pre-tested before finalization. The questionnaire was developed by modifying questions from an existing questionnaire that has been used in a similar study, and the final version had 60 questions (Doorduyn et al., 2012). The authors of that study approved the use and adaptation of their questionnaire for this study.

For each participant, information regarding socio-demographic characteristics such as age, education, employment status, monthly income, and type of accommodation was collected. Furthermore, information about the occurrence and severity of IID symptoms such as diarrhoea and vomiting in the 4-week period prior to the interview was collected. Parents were asked to complete the questionnaire on behalf of the child in their household that was selected using the next birthday method. The data collection was standardized between the trained interviewers and the majority of questions were closed ended multiple choice. A participant was considered to be a non-responder after failure of the trained interviewer to obtain a response to four independent calls at different times on at least two different days of separate weeks. Monitoring of progress was completed on a weekly basis, and monthly meetings were held with all trained interviewers.

Case definition

The International Collaboration on Enteric Disease 'Burden of Illness' studies definition of IID was used. This defines an IID as a condition where a person has three or more loose stools or any vomiting in 24 h that was not due to the consumption of alcohol, pregnancy, or drugs, and excluding those with cancer of the bowel, irritable bowel syndrome, ulcerative colitis, Crohn's disease, celiac disease, or other chronic illnesses with symptoms of diarrhoea or vomiting in the 4 weeks prior to completion of the questionnaire (Doorduyn et al., 2012).

Data analysis

The data analysis was conducted using Stata version 15.0. Participants considered as having had an episode of IID were compared with asymptomatic participants regarding several characteristics and exposures, including age, sex, marital status, living condition, living area, family income, work status, nationality category, and level of education. The Chi-square test or Fisher's exact test was applied to compare the prevalence of IID for categorical variables. The two-sample t-test was applied to compare the prevalence of IID for continuous variables. Univariate

and multivariate logistic regression analysis were performed to ascertain the association between various socio-demographic variables and IID. A p-value of ≤ 0.05 and 95% confidence intervals (95% CI) were chosen to determine statistical significance.

Results

A total of 1728 households were contacted by telephone, of which 822 responded to the telephone call (47.6% initial response rate) and were invited to take part in the study. Of these, 547 households agreed to participate (31.7% participation rate) and 275 refused. All household participants completed the consenting process before answering the questionnaire. Participants living in a family setting were asked if the interviewer could have access to the spouse and a child. In this way, the final study sample was 1254 individuals, with 391 being spouses and 316 being children. The participation rate for UAE nationals was higher than for non-nationals (52.3% and 47.7%, respectively; $p = 0.044$). The participation rate was higher for male than for female subjects (57.3% and 42.7%, respectively; $p < 0.001$). One quarter of the study sample were children (25.2%), almost half of the participants (47.7%) were non-nationals, and almost half of the participants (49.0%) were from urban areas. Details of the demographic characteristics are presented in Table 1.

Prevalence of IID

The overall prevalence of participants reporting an IID in the 4-week period preceding the telephone interview was 4.2% ($n = 53$). IID were more prevalent in children than in adults (prevalence 9.8% compared with 2.3%; $p < 0.001$). IID were significantly more prevalent in UAE nationals compared with non-nationals (prevalence 69.8% and 30.1%, respectively; $p \leq 0.05$).

Out of the 53 participants with an IID, only half (49.0%) sought medical care and 13.2% asked pharmacists for advice on how to manage their condition. Of those who sought medical care, less than a fifth (18.9%) provided a stool sample and 5.7% of them were hospitalized. The majority of individuals who had an IID took medication (69.8%), of which 20.8% were without a prescription (i.e., over-the-counter medication). The IID affected the daily routine of many participants. For example, it stopped 11.3% of affected participants from going to work or to school. Of the 53 participants with an IID, 35.8% had additional concomitant infections (respiratory tract infection, skin infection, urinary tract infection, and/or eye, ear, nose and mouth infections). The most suggested causes of illness provided by the participants with an IID were the consumption of contaminated food (47.2%) and infection from another person (26.4%). The prevalence of IID showed seasonal variation, with the highest prevalence in February and March ($p \leq 0.05$) (Figure 1).

Univariate analysis

From the univariate analysis, the prevalence of IID was significantly higher in nationals than non-nationals ($p \leq 0.05$). Furthermore, those aged 18–59 years were significantly less likely to report an IID than participants aged 6–17 years ($p \leq 0.05$), and being married was protective from IID ($p \leq 0.05$). Students were significantly more likely to report an IID ($p \leq 0.05$) and participants with an average monthly income of AED 15 000 (approx. USD 4080) were significantly more likely to report an IID than those with a lower average monthly household income ($p \leq 0.05$).

Multivariate analysis

All variables were initially included in the model (age, sex, marital status, living conditions (family, non-family), employment status, degree of urbanization, nationality, level of education, contact with animals, and average monthly household income). Variables that were not statistically significant (i.e., $p > 0.05$) were then removed one at a time and only the variables with a p-value of ≤ 0.05 were retained. Age, sex, employment status, and average monthly household income were the significant determinants in the final model. In the multivariate analysis, being female and having a middle-range monthly household income (AED 5000–14,999 or AED 15 000–24 999) were positively associated with reporting an IID, while age ≥6 years was negatively associated with reporting an IID (Table 2).

Table 1
Demographic characteristics of the study sample ($n = 1254$).

Characteristics	Participants, *n* (%)
Age (years)	
0–5	89 (7.1)
6–17	227 (18.1)
18–59	856 (68.3)
≥60	82 (6.5)
Sex	
Male	718 (57.3)
Female	536 (42.7)
Marital status	
Single	370 (29.5)
Married	864 (69.0)
Separated/divorced	5 (0.4)
Widowed	14 (1.1)
Participant lives	
Alone	64 (5.1)
With spouse	797 (63.6)
With family	325 (25.9)
Non-family (bachelor accommodation)	68 (5.4)
Employment status	
At work	523 (41.9)
Unemployed	4 (0.3)
Student	252 (20.2)
Retired	64 (5.1)
Looking after home/family	330 (26.4)
Long term sick/disabled	2 (0.2)
Work details unknown	73 (5.9)
Geographical location	
Urban	614 (49.0)
Suburban	640 (51.0)
Nationality	
Emirati	656 (52.3)
Non-Emirati	598 (47.7)
Educational level	
No formal schooling	169 (13.7)
Completed primary schooling	209 (16.9)
Completed intermediate schooling	131 (10.6)
Completed secondary schooling	369 (29.9)
Completed college or university	338 (27.3)
Completed Master degree or PhD	20 (1.6)
Contact with animals	
No	1006 (80.2)
Yes	248 (19.8)
Monthly household income, AED (approx. USD)[a]	
AED <5000 (USD <1360)	231 (22.0)
AED 5000–14 999 (USD 1360–<4080)	355 (33.9)
AED 15 000–24 999 (USD 4080–<6800)	232 (22.1)
AED 25 000–34 999 (USD 6800–<9530)	163 (15.6)
AED ≥35 000 (USD ≥9530)	67 (6.4)

[a] AED denotes Emirati Dirham; USD denotes United States Dollar; based on USD 1.00 ≈ AED 3.67.

Discussion

This is the first population-based study using a representative sample on the prevalence of and factors associated with IID in the UAE. As such, there are no previously published data to compare with the present study findings. The only other IID study in the UAE was conducted in the emirate of Dubai (which has a different population), which reported (1) retrospective hospital data that

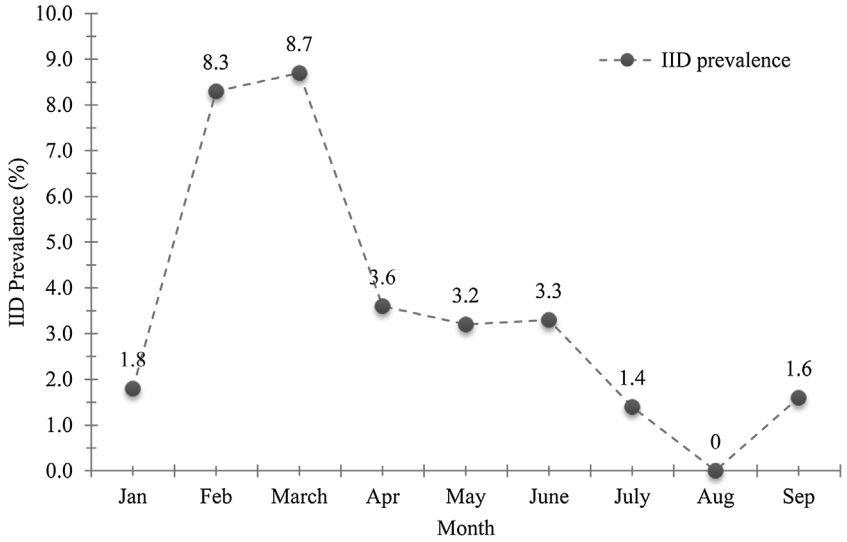

Figure 1. Prevalence of infectious intestinal diseases for each month from January to September 2017.

Table 2
Univariate and multivariate analysis of factors associated with infectious intestinal diseases, Ras Al Khaimah, United Arab Emirates, 2017.

Variables	Univariate OR (95% CI)	Multivariate OR (95% CI)
Age (years)		
0–5	Ref.	Ref.
6–17	0.43 (0.20–0.92)	0.95 (0.90–0.99)
18–59	0.13 (0.06–0.27)	
≥60	0.06 (0.00–0.51)	
Sex		
Male	Ref.	Ref.
Female	1.41 (0.18–2.44)	2.43 (1.16–5.07)
Marital status		
Single	Ref.	Ref.
Married	0.18 (0.10–0.34)	0.67 (0.08–5.09)
Separated/divorced/widowed	1.85 (0.51–6.68)	12.54 (0.82–189.95)
Live		
Alone	Ref.	–
With spouse	1.29 (0.30–5.53)	–
With family	1.92 (0.43–8.47)	–
Employment status		
At work	Ref.	Ref.
Student	4.23 (2.00–8.92)	0.38 (0.04–3.30)
Retired	1.50 (0.32–6.93)	4.32 (0.71–26.25)
Looking after home/family	1.00 (0.38–2.62)	0.23 (0.06–0.90)
Work details unknown	8.33 (3.53–19.63)	0.83 (0.08–8.61)
Geographical location		
Urban	Ref.	–
Suburban	1.75 (0.99–3.11)	–
Nationality		
Emirati	Ref.	–
Non-Emirati	0.45 (0.25–0.83)	–
Level of education		
No formal schooling	Ref.	–
Completed primary schooling	0.62 (0.33–1.21)	–
Completed secondary/intermediate schooling	0.31 (0.14–0.72)	–
Completed college or university	0.43 (0.23–0.90)	–
Contact with animals		
No	Ref.	–
Yes	1.63 (0.88–3.03)	–
Monthly household income, AED (approx. USD)[a]		
AED <5000 (USD <1360)	Ref.	Ref.
AED 5000–14 999 (USD 1360–<4080)	4.00 (0.88–18.06)	3.99 (0.85–18.70)
AED 15 000–24 999 (USD 4080–<6800)	6.24 (1.38–28.22)	5.42 (1.15–25.48)
AED 25 000–34 999 (USD 6800–<9530)	7.48 (1.61–34.62)	7.13 (1.47–34.57)
AED ≥35 000 (USD ≥9530)	7.26 (1.30–40.60)	6.16 (1.02–36.88)

OR, odds ratio; CI, confidence interval; '-', not included in the multivariate logistic regression model.
[a] AED denotes Emirati Dirham; USD denotes United States Dollar; based on USD 1.00 ≈ AED 3.67.

had been archived for almost 20 years, and (2) a crude incidence rate as opposed to prevalence (Khamis and Hussain, 2015). There has been only one other study in the Gulf region. A school-based study in the city of Jeddah in KSA (2004–2005) reported an IID prevalence of 14.7% amongst male school children aged 7–12 years.

The overall prevalence of IID in the present study sample comprising adults and children was 4.2% in the 4 weeks prior to the interview. The prevalence of IID amongst children aged 7–12 years in this sample was 9.4%. The estimated prevalence of IID in this study (i.e., 4.2%) is lower than that reported in other studies from developed countries. For example, the IID prevalence was reported to be 10% in Canada (Majowicz et al., 2004), 7% in the Netherlands (Doorduyn et al., 2012), and 6% in the USA (Imhoff et al., 2004). However, the IID prevalence in RAK is similar to that reported in China, which was 4% (Gurpreet et al., 2011).

Factors associated with IID

Young children, being female, and certain months of the year were identified as factors associated with IID in this study. In RAK, children aged ≤5 years were more likely to have an IID than those who were aged ≥6 years. Younger age has been found to be a factor associated with IID in other studies. In the Netherlands, a factor significantly associated with community IID was age below 5 years (Doorduyn et al., 2012). In Italy, children had a significantly higher incidence rate of IID (Scavia et al., 2012) and children aged 0–4 years in China had the highest IID prevalence (Chen et al., 2013).

Sex was found to be a significant factor associated with IID, and female participants in RAK were more likely to report an IID than male participants. These findings are in agreement with those from Canada, where a higher prevalence of IID was found in females (Majowicz et al., 2004), and China, where the prevalence of IID was significantly higher in females as compared to males (4.9% vs. 3.9%, respectively) (Chen et al., 2013). Females may have a higher risk of acquiring IID due to greater contact with raw ingredients during cooking and food preparation, and also closer contact with children, both of which increase the potential of exposure to IID. In contrast, a study conducted in Barbados found that the prevalence of IID was higher in males (Ingram et al., 2013). The higher prevalence in males was suggested to be because of their tendency to eat more frequently outside of the home (Ingram et al., 2013). Interestingly, studies conducted in Malaysia (Gurpreet et al., 2011) and the USA (Imhoff et al., 2004) reported that the incidence and prevalence (respectively) of IID was found to be the same in males and females.

In RAK, a middle-range household income was positively associated with IID. In contrast, studies in China (Chen et al., 2013) and Malaysia (Gurpreet et al., 2011) found no association between monthly household income and IID. However, the present study results are in concordance with those of the study in Barbados, which reported a positive association between household income and IID (Ingram et al., 2013). The study in Barbados suggested that this observed relationship may be due to a higher frequency of eating outside the home in higher income households (Ingram et al., 2013). In this RAK study, the positive relationship between middle-range household income and IID may also be due to eating outside of the home, although further studies would be needed to confirm this hypothesis.

A seasonal variation in IID prevalence has been documented in several studies, although there is no consistency regarding which season or months are associated with increased IID prevalence. Several studies in Italy, Malta, and the USA have found that the prevalence of IID is higher during the winter months compared with the other seasons. In Malta, the winter months were positively associated with community IID (Gauci et al., 2010). Similarly, the prevalence of IID peaked between November and March in Italy, and these months are considered as the start and end of winter (Scavia et al., 2012). In the USA, a higher prevalence of IID cases was found during the winter season (December, January, and February) (Imhoff et al., 2004). In contrast, a study conducted in the Netherlands found that the prevalence of IID was higher in the spring and autumn; however, the results of this study refer to the month of interview (Doorduyn et al., 2012). Although we did not sample the whole year, in this study covering 9 months, the prevalence of IID was highest at the end of winter and the beginning of spring (February and March).

Strengths and limitations

This study provides the first prevalence estimates for IID from a representative sample of the RAK (UAE) population. Despite the strengths of the study design, there are a number of potential limitations that need to be discussed.

Recall bias (where the participants telescope their illness events in the past into the observation period) is one of the potential limitations that is frequently found in self-reported IID studies and may lead to an overestimation of IID prevalence (Gauci et al., 2006; O'Brien et al., 2010). However, the participants were asked about the exact date of their symptoms in order to minimize this issue.

There is also the possibility that the results in fact underestimate the true prevalence. With this being a population-based study investigating IID, and in view of the fact that in UAE culture discussing issues related to the bathroom and excretion outside the clinical setting is considered embarrassing, it is possible that some participants did not admit to having had an IID in order to avoid an uncomfortable conversation with the interviewer. Furthermore, it is notable that there were zero cases of IID reported from participants living in group accommodation. Most of these individuals are male expatriate workers who have come to the UAE from countries endemic for infectious diseases, to make a living through skilled or unskilled labour. This finding is unusual, since many studies have found that those who are living in high-density shared accommodation are more susceptible to IID (Abu-Madi et al., 2008; Giorgi Rossi et al., 2017). It is plausible that these workers feared that reporting any kind of illness might be taken against them and affect their work status and job security. In addition, it is possible that collecting such data from the migrant population using anonymous data collection methods might overcome deliberate underreporting in future studies. A final possibility is that these individuals have a relatively low socioeconomic status and as a result they have a higher tolerance to conditions such as transient fever, intestinal cramps, and diarrhoea.

One point to consider is whether the study recruitment method introduced any selection bias or underrepresentation of individuals from large households. The primary aim of the sampling and recruitment strategy was to recruit a representative sample of the general population in RAK. Previous population-based telephone surveys performed by our research group in the UAE (Abdulla et al., in press) found that the telephone number and billing for a household is usually linked to a male head of the household. This is primarily due to the social hierarchical structure in the UAE population (Abdulla et al., in press). In consideration of this phenomenon, it was aimed to recruit one male, one female, and one child from each household. This recruitment strategy was developed to minimize the likelihood of recruiting a predominantly male sample and to maximize the possibility of recruiting a representative sample of males, females, and children.

We did not collect data on the number of people living in each household, only whether the respondent lived alone, with a spouse, family, or non-family. It would be prudent for future population-based cross-sectional studies in the Gulf region to

collect data on the number of individuals living within a household and to explore the relationship between household occupancy and the prevalence of IID. Some households in the UAE employ expatriate domestic workers to help with childcare and/or food preparation. We did not collect information on whether a household employed a domestic worker, the number of domestic workers, or the duties performed by the domestic workers. The presence of an expatriate domestic worker within a household may potentially increase or decrease the prevalence estimates of IID in the UAE. Future studies may want to consider including these members of the household in their sampling and recruitment strategy, or at least collect information on the number of domestic workers and their role within the household.

Many surveys are prepared in one language and do not consider potential participants living in the same area and speaking a different language to the native language (Gibbons et al., 2014). For example, the telephone survey in Canada was only conducted in English and 9% ($n = 568$) of the 6047 people did not participate due to language problems (Majowicz et al., 2004). In the present study, the survey tool was produced in three languages to minimize selection bias (i.e., excluding participants due to a language barrier) and maximize the recruitment of a representative sample of the RAK population, which is a multi-national population.

It was not possible to present prevalence estimates weighted or standardized by the population composition of RAK. Accurate and reliable population estimates and composition (e.g., by nationality or by UAE national and non-national) of the RAK population are not publicly available. The UAE Government reports that RAK is the fourth largest emirate with an estimated total population of 300 000 (United Arab Emirates Government, 2019). The last publicly available census data for the UAE is from 2005, which estimated the total population of RAK to be 210 063 (61.6% male; 41.8% UAE national) (United Arab Emirates Federal Competitiveness and Statistics Authority, 2019). The population sampled in 2017 was 57.3% male and 41.8% UAE national. However, it is not possible to gauge the true representativeness of the sample without recent data on the population growth of the UAE national and non-national populations in RAK over the past 12 years.

Finally, the prevalence estimates reported in this study can only be generalized to the RAK population. There are considerable differences in population size and composition across the seven emirates that may influence the epidemiology of IID within different emirates. Based on the last 2005 census data, Ras Al Khaimah had the fourth largest population ($n = 210\ 063$) and the second highest proportion (41.8%) of UAE nationals compared to the emirates of Abu Dhabi ($n = 1\ 399\ 484$; 25.0% UAE nationals), Dubai ($n = 1\ 321\ 453$; 10.4% UAE nationals), and Sharjah ($n = 793\ 573$; 17.4% UAE nationals), which had larger populations with a greater proportion of expatriates (United Arab Emirates Federal Competitiveness and Statistics Authority, 2019).

In conclusion, IID at the population level remains largely undetected through many surveillance methods. In this population-based study, the prevalence of IID was estimated to be 4.2% in a representative sample of the RAK population. The factors associated with IID were being female and age below 6 years. Since this is the first population-based telephone survey of IID in the UAE, it is possible that the prevalence reported is a conservative estimate. Future IID studies in the UAE may want to target specific high-risk groups such as expatriate workers living in shared accommodation, who may have a higher prevalence of IID.

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Ethical approval

This study was reviewed and approved by the Social Sciences Ethics Committee of the United Arab Emirates University (reference number ERS_2015_3207).

Data availability

All relevant data are within the paper. Access to the raw data is legally governed by the Institute of Public Health, United Arab Emirates University (United Arab Emirates) and data are available after application and agreement with the Institute of Public Health (United Arab Emirates University). In addition to this application, an existing or new approval from the Social Sciences Ethics Committee of the United Arab Emirates University may be required. Details on this procedure are available from the corresponding author.

Conflict of interest

The authors declare that they have no conflict of interest.

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