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Internet addiction in Gulf countries: A systematic review and meta-analysis

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REVIEW ARTICLE



ABSTRACT

Background and aims: The prevalence of internet addiction (IA) varies widely in the Gulf Cooperation Council (GCC) countries (4%–82.6%). We aimed to assess the quality of IA studies from the GCC and pool their data to get an accurate estimate of the problem of IA in the region. **Methods:** A systematic review of available studies was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. PubMed, Embase, and Cochrane Controlled Register of Trials were systematically searched; studies conducted in GCC countries (i.e., Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) with a validated instrument for internet addiction assessment were eligible. Ten studies were eligible for the systematic review, all of which were included in the meta-analysis. The Newcastle Ottawa Scale was used for quality assessment. **Results:** Nine out of ten of the included studies had either adolescent and/or young adult participants (age < 25). Two studies were of ‘good’ quality, six were of ‘satisfactory’ quality, and two were of ‘unsatisfactory’ quality. The pooled internet addiction prevalence was 33%; it was significantly higher among females than males (male = 24%, female = 48%, $P = 0.05$) and has significantly increased over time ($P < 0.05$). **Discussion and conclusions:** One in every three individuals in GCC countries was deemed to be addicted to the internet, according to Young’s Internet Addiction Test. A root cause analysis focusing on family structure, environment, and religious practices is needed to identify modifiable risk factors.

KEYWORDS

Gulf Cooperation Council, internet addiction, prevalence

INTRODUCTION

Internet addiction (IA) is characterized as a prolonged, compulsive, and uncontrollable use of the internet that adversely affects users psychologically and physically (Derevensky, Hayman, & Lynette, 2019). Almost one in every ten individuals in the US and Europe is addicted to the internet (Weinstein & Lejoyeux, 2010). Adolescents, most of whom are students, make up the largest share of affected individuals (Kuss & Lopez-Fernandez, 2016).

There is a debate whether “internet addiction” is a unique disorder that is general in nature or whether the disorder is limited to specific activities available via the internet (e.g., video gaming, shopping, gambling). Accordingly, the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) (American Psychiatric Association, 2013) has only identified internet gaming disorder as an emerging area that needs future research (Griffiths, 2014). Brand et al., in their 2020 report, emphasized the need for clinical relevance, theoretical embedding, as well as empirical evidence before a behavior could be labeled as addictive (Brand et al., 2020). Since internet addiction does not have that formal recognition, a wide

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range of terms (e.g., problematic use, compulsive use, excessive use, etc.) are being used interchangeably to describe it in the literature, adding complexity and instability to this construct.

The Gulf Cooperation Council (GCC) is an economic union among six Arab countries—Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. These countries are significantly wealthy, technologically advanced, and rank very high in the United Nation's Human Development Index (United Nations Development Programme, 2019). An overwhelming percentage of the population in these countries has internet access (Saudi Arabia = 93%, Qatar and Kuwait = 100%) (The World Bank, 2019). The available data show that the prevalence of IA in GCC countries ranges anywhere from 4% to 82.6% (Abdel-Salam, Alrowaili, Albedaiwi, Alessa, & Alfayyadh, 2019; Alhantoushi & Alabdulateef, 2014; Alshehri, Azahrani, & Alotaibi, 2015; Barayan, Al Dabal, Abdelwahab, Shafey, & Al Omar, 2018; Bener & Bhugra, 2013; Hasan & Jaber, 2019; Khan & Awan, 2017; Khan & Gadhoun, 2018; Nafee, Mohammed, & Al-Hamdan, 2018; Taha, Shehzad, Alamro, & Wadi, 2019). The considerable wealth and access to advanced technology contribute to such high estimates. Additionally, variation in the definition of the problem (e.g., problematic, excessive, addictive use of internet), differences in the sample compositions (e.g., age and gender distribution), and use of disparate tools for outcome assessment may have contributed to the variation in prevalence estimates. It is also likely that these studies differed in terms of methodological quality. A comprehensive assessment of bias could separate high-quality studies from poor-quality ones, and an aggregation of high-quality studies will give a more accurate prevalence estimate.

Internet connectivity has increased dramatically recently. For example, the internet service growth rate in Saudi Arabia is ten times higher than the world's growth rate (Simsim, 2011). A common characteristic of GCC countries is that their demographic distribution tilts heavily towards the young; the proportion below the age of 25 ranges between 35% and 40% (United Nations, 2019). These young people, like their peers from elsewhere in the world, are the major users of technology (e.g., smart phones, tablets, etc.). Additionally, available data indicate that IA might be higher among Arab females than males (Al-Gamal, Alzayyat, & Ahmad, 2016; Mohamed & Bernouss, 2020). In the context of GCC countries' general social and religious conservatism, coupled with harsh weather and lack of outdoor facilities available to women, it is understandable that they tend to stay more indoors and seek out internet-related activities.

Our systematic review and meta-analysis included all relevant publications on IA from GCC countries. The specific objectives were to (1) describe the general characteristics of the studies, (2) assess the quality of included studies, and (3) provide a pooled estimate on IA prevalence as a whole and stratified by publication year and gender. In addition, this review identifies gaps in the existing literature and makes specific recommendations for the direction of future research.

METHODS

Protocol and registration

This systematic review and meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group, 2009). The review protocol was submitted to the International Prospective Register of Systematic Reviews (PROSPERO) in December 2019 for registration before the screening of search results and analysis of data began. The PROSPERO registration number is CRD42020161724.

Search strategy and study selection

Three databases were searched in April 2020: PubMed, Embase, and Cochrane Controlled Register of Trials (CENTRAL). The search period was from inception to April 1, 2020. For PubMed, two distinctive search strategies (i.e., Medical Subject Headings [MeSH] and search box) were implemented in order to ensure maximum accuracy in identifying all eligible articles. The MeSH is a comprehensive controlled vocabulary, and each MeSH term acts as an umbrella term that includes all the related terms, such as "excessive use" and "problematic use," etc. As the MeSH does not contain "internet addiction" as a distinct term, the closest term "internet" was used. For the search-box strategy in PubMed, the following terms were used: "internet addiction" or "problematic internet use" or "excessive internet use" and "country." The CENTRAL database was searched with the same MeSH terms used in PubMed. On the other hand, a multi-field search was used in Embase with the following terms: "internet addiction" or "problematic internet use" or "excessive internet use" and "country." Each GCC country was entered (i.e., Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) in place of "country" for all aforementioned databases. In addition, the reference lists of all eligible articles were manually searched to identify any further eligible studies.

Inclusion and exclusion criteria

Studies were eligible if they (1) selected study participants from and were conducted in any GCC country, and (2) used a validated test for the assessment of IA (i.e., inclusion criteria). Studies that did not include primary research (e.g., opinion, letter to the editor) and conference proceedings/abstracts were excluded (i.e., exclusion criteria). There was no restriction on language or type of study (Table 1).

Data extraction

Two co-authors (AMA and MAK) independently extracted and charted the data from the included studies using a predefined data-extraction sheet. Data extracted from eligible articles included (1) authors' names, (2) publication year, (3) study design, (4) sample age and size, (5) study population, (6) gender distribution, (7) location, (8) instrument



Table 1. Inclusion and exclusion criteria used in this review (GCC: Gulf Cooperation Council, IA: internet addiction)

Inclusion criteria	Exclusion criteria
Participants from GCC countries	Unvalidated IA test/no IA data
Conducted in GCC countries	Not primary research
Used a validated IA test	Conference proceedings/abstracts
Primary research	

used to identify IA, and (9) main findings. The co-authors compared the independently extracted data and settled disagreement through discussion and consensus building. We used Krippendorff's alpha to formally assess interrater reliability (Hayes & Krippendorff, 2007). The data extractors had no disagreement (Krippendorff's alpha = 1).

Quality assessment

The Newcastle Ottawa Scale (NOS, item =7) for cross-sectional studies (adapted from the cohort scale) was used to evaluate the quality of the included studies (Herzog et al., 2013). The NOS assesses studies in three broad areas: the selection of the study groups, the comparability of the groups, and the ascertainment of either the outcome or exposure of interest. Studies were classified according to the summary score as very good (9–10), good (7–8), satisfactory (5–6) or unsatisfactory (0–4) (Herzog et al., 2013). AMA and AMR independently performed quality assessment; senior researchers NS and JS ensured the consensus for all records.

Data synthesis and meta-analysis

The number of participants addicted to the internet and the number not addicted were extracted from each study in order to calculate the overall IA prevalence using a random effect model due to the highly heterogeneous study pool (Barendregt, Doi, Lee, Norman, & Vos, 2013). Additionally, the pooled IA prevalence was estimated by gender and study quality. The effects of study quality, gender, and year of publication on the pooled IA prevalence were further investigated using meta-regression. All of the included studies used a validated assessment tool, but a few studies ($n = 3$) used modified versions of that scale. The pooled estimates from those studies were evaluated separately as a sensitivity analysis. Regarding the studies that used the unmodified version, there was a lack of consistency in the cut-off value they used to define IA. Therefore, studies that used the unmodified test and determined a cut-off value of ≥ 50 to define IA were pooled together.

Doi plots were evaluated to assess the possibility of publication bias. The Luis Furuya-Kanamori (LFK) index was used to quantitatively measure the plots' asymmetry. No asymmetry was an LFK index of < 1 , minor asymmetry was 1–2, and major asymmetry was > 2 . The LFK index paired with the Doi plots has higher sensitivity and power to detect publication bias than the conventional funnel plot and

Egger's regression, especially when the number of studies is low (Furuya-Kanamori, Barendregt, & Doi, 2018).

The between-study heterogeneity was evaluated with Higgin's I^2 statistic, and P values for heterogeneity were obtained from a random-effects model. An I^2 statistic with a value below 25% was considered low likelihood of differences between studies, a value of 25%–75% as a moderate likelihood, and those with a value of 75%–100% represented a high likelihood (Higgins, Thompson, Deeks, & Altman, 2003).

A standard Leave-One-Out sensitivity analysis was performed to detect studies that influenced the pooled estimates the most and to check for the robustness of the estimates. In this method, pooled estimates were re-calculated multiple times, each time leaving out one study to ensure that no single study was driving the findings. Meta-analyses in this review were conducted using MetaXL v. 5.3 (EpiGear International Pty Ltd., Sunrise Beach, Queensland, Australia) and Meta package in the R statistical programming language, version 3.6.3 (R Foundation for Statistical Computing).

RESULTS

Literature search results

Respectively, 136, 17, and 28 articles were retrieved from PubMed, CENTRAL, and Embase (total $n = 181$). The titles and abstracts of the articles were screened for duplicates ($n = 19$), articles with irrelevant titles and/or abstracts ($n = 141$), and studies conducted outside the GCC ($n = 3$), which left 18 eligible studies. Four more studies that met the inclusion criteria were identified from the reference lists of the primary 18 articles, which resulted in 22 eligible studies. Out of 22, ten did not report any IA estimate, one was a duplicate of another included study, and one recruited participants from outside the GCC. Thus, ten studies were included in the final meta-analysis (Fig. 1).

Narrative description of the studies included in the meta-analysis

Table 2 summarizes the characteristics of studies included in the meta-analysis. All were from Saudi Arabia and Qatar (none from the other four GCC countries), cross-sectional in design, and were conducted between 2013 and 2019. All but one study (Khan & Gadhoom, 2018) had either school or university students as participants; the study that included adults had a mixed sample (roughly 50% were over age 25). Three studies (Abdel-Salam et al., 2019; Barayan et al., 2018; Hasan & Jaber, 2019) collected data exclusively from female participants. All studies together enrolled 7,620 participants, and the majority were female (61%). As for the correlates of IA, three studies assessed mental health (Alhantoushi & Alabdullateef, 2014; Alshehri et al., 2015; Bener, Al-Mahdi, Vachhani, Al-Nufal, & Ali, 2010), two studies assessed sleep quality/quantity (Abdel-Salam et al., 2019; Taha et al., 2019), and one study assessed academic performance (Hasan & Jaber, 2019).

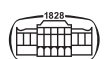


Table 2. Descriptive characteristics of the studies included in the systematic review (IAT: Internet Addiction Test, IA: internet addiction)

Author, Year	Sample size	Sampling strategy	City, country	Sample composition	Sample source	Mean age	Assessment tool	Addict criterion	Reported IA prevalence %
Bener and Bhugra (2013)	2,298	Random	Doha, Qatar	Females 28.4% Males 71.6%	School students	18.6 years	IAT	≥50	17.6
Alhantoushi and Alabdullateef (2014)	716	Random	Riyadh, Saudi Arabia	Females 45.3% Males 54.7%	School students	17 years	IAT	≥70	5.3
Alshehri et al. (2015)	279	Not random	Taif, Saudi Arabia	Females 54.1% Males 45.9%	University students	Not reported	IAT	≥70	4
Khan and Awan (2017)	432	Random	Doha, Qatar	Females 72.3% Males 27.7%	University students	Not reported	Modified IAT	Not mentioned	82.6
Khan and Gadhoom (2018)	306	Not random	Al-Hassa, Saudi Arabia	Females 26% Males 74%	School/university students and adults	Not reported	Modified IAT	Not mentioned	41.1
Barayan et al. (2018)	2,516	Not random	Dammam, Saudi Arabia	Females only	University students	21 years	Modified IAT	>70	30
Nafee et al. (2018)	331	Not random	Jeddah and Dammam, Saudi Arabia	Females 17.2% Males 82.8%	Teens	Not reported	IAT	≥50	46.2
Hasan and Jaber (2019)	163	Not random	Jeddah, Saudi Arabia	Females only	University students	Not reported	IAT	≥50	67.5
Taha et al. (2019)	209	Random	Buraydah, Saudi Arabia	Females 42.1% Males 57.9%	University students	Not reported	IAT	≥50	12.4
Abdel-Salam et al. (2019)	370	Random	Jouf, Saudi Arabia	Females only	University students	20.85 years	IAT	≥50	51.4





Table 3. Breakdown of the quality assessment using the Newcastle Ottawa Scale (NOS) of the studies included in the systematic review

Author (Year)	Selection				Outcome			Total (*10)
	Representativeness of the sample (*)	Sample size (*)	Non-respondents (*)	Ascertainment of the exposure (risk factor) (**)	Comparability (**)	Assessment of outcome (**)	Statistical test (*)	
Bener and Bhugra (2013)	1	0	0	2	1	1	1	6
Alhantoushi and Alabdullateef (2014)	1	1	0	2	0	1	1	6
Alshehri et al. (2015)	0	1	0	2	0	1	1	5
Khan and Awan (2017)	1	0	0	2	2	1	1	7
Khan and Gadhoum (2018)	0	0	0	2	0	1	1	4
Barayan et al. (2018)	0	0	0	2	2	1	1	6
Nafee et al. (2018)	0	0	0	2	0	1	1	4
Hasan and Jaber (2019)	0	1	0	2	0	1	1	5
Taha et al. (2019)	1	1	0	2	0	1	1	6
Abdel-Salam et al. (2019)	1	1	1	2	2	1	1	9

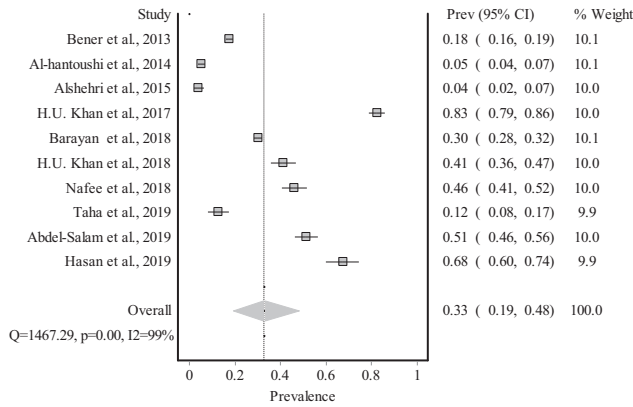


Fig. 2. Forest plot of pooled prevalence of internet addiction in the GCC (Prev: Prevalence, CI: Confidence interval, Q and I^2): Heterogeneity statistics)

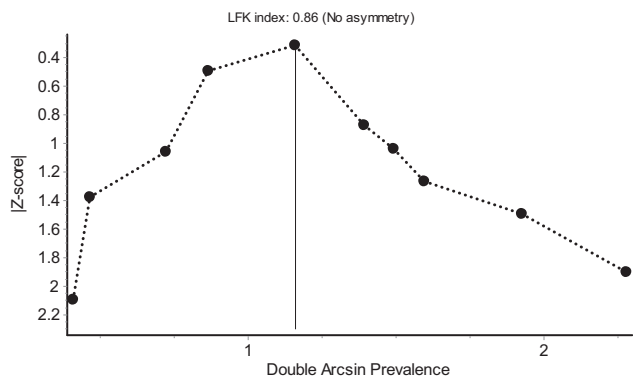


Fig. 3. Doi plot showing the risk of publication bias in the meta-analysis of internet addiction prevalence (LFK: Luis Furuya-Kanamori index)

DISCUSSION

The salient findings of this review were (1) the pooled IA prevalence in GCC countries was 33% (i.e., one in every three individuals in GCC countries can be classified as addicted to the internet, according to Young’s Internet Addiction Test criteria), (2) the IA prevalence was significantly higher among females than males (48% vs. 24%), and (3) there was an increase in IA prevalence over time.

A 2014 report stated that IA prevalence was 11% in the Middle East, much higher than the global prevalence of 6% (Cheng & Li, 2014). The 7% prevalence that our review found among studies prior to 2015 was comparable to that report. The current review also showed that a significant rise in IA has taken place since 2015. A recent study in Iran—a country geographically related to the GCC—reported that one out of every five school and university students was addicted to the internet (Modara et al., 2017). The majority (6 out of 10) of the studies in our review had university students as participants; two were among students in the medical field. The pooled IA prevalence among Chinese medical students was 30%, not much different from the

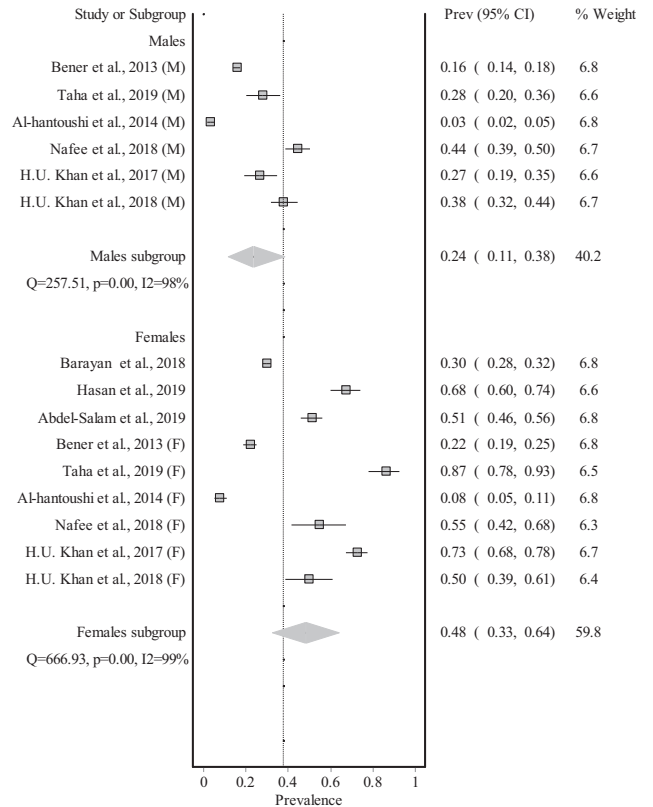


Fig. 4. Forest plot of pooled prevalence of internet addiction subgrouped by gender (M: Males, F: Females, Prev: Prevalence, CI: Confidence interval, Q and I^2): Heterogeneity statistics)

overall prevalence reported in this study (Zhang, Lim, Lee, & Ho, 2018).

The high prevalence of IA in GCC countries reported in this review is plausible for several reasons. Young Arabs spend a substantial amount of time in front of screens. For example, among 14 to 19-year-old Saudis, 84% of males and 91% of females reported excessive screen time (>2 h per day) (Al-Hazzaa et al., 2014). Digital technologies are well-integrated into GCC societies; most GCC inhabitants have access to electronic devices (e.g., smartphones, tablets, and computers) (Taha et al., 2019). The extremely hot weather also prevents people from being active outside, particularly during the daytime.

This review made several observations about the included studies: (1) females were over-represented, (2) adults were under-represented, (3) samples lacked diversity, (4) the IA detection criteria varied, and (5) assessments of IA correlates were not comprehensive.

Three of the included studies enrolled females only, which artificially raised the female–male ratio to 1.6:1 and likely affected the pooled prevalence of IA. Almost all studies (9 of 10) targeted students as participants; in Khan and Gadhoom (2018) adults constituted only 50% of the sample. Therefore, the prevalence of IA among older adults in GCC countries is largely unknown. Additionally, these studies were conducted in educational settings, and therefore did not represent the level of IA among youths who dropped out

of school. There was no uniformity in the definition of IA (>50 vs. >70) although the studies used the same instrument (i.e., Young's Internet Addiction Test). Finally, though many studies assessed various correlates of IA, none of them assessed the role of various factors such as family structure, family environment, and religiosity, which might influence internet use among young adults. Studies from abroad, particularly those from Southeast Asia, have indicated that family plays a crucial role in the development of internet addiction. Addiction was more likely among families with single or divorced parents, inter-parental conflict, and parent-child conflict. Similarly, less quality time among family members was associated with internet addiction among children (Li, Garland, & Howard, 2014; Shek, Zhu, & Dou, 2019). Other family factors that are unique to Middle Eastern cultures, such as large family size, multiple wives, religiosity, and hierarchical family atmosphere, have not been assessed.

There have been studies that defined outcomes as "problematic internet use" (PIU) as opposed to "internet addiction." Since clinical diagnosis of internet addiction has not been established, "problematic internet use" seems to capture the essence of overuse and/or dependency. However, studies reporting PIU differed greatly in prevalence (7.9%–55%) (Cam & Ustuner Top, 2020; Kumar, Singh, Singh, Rajkumar, & Balhara, 2019; Laconi et al., 2018; Mazhari, 2012; Moreno, Eickhoff, Zhao, Young, & Cox, 2019). Use of disparate instruments (e.g., Young's Internet Addiction Test, Problematic Internet Use Questionnaire, Problematic and Risky Internet Use Screening Scale, Generalized Problematic Internet Use Scale 2, etc.), differences in cut-off values to define PIU, and sample differences were likely responsible for the discrepancies in reported prevalence.

Young's Internet Addiction Test is widely used to assess internet addiction. Yet, the usefulness of this instrument is questionable for a number of reasons. Since internet addiction is not a recognized clinical condition, there are limited validation studies available for this instrument. The few that exist failed to find a significant correlation between IAT score and clinical assessment of addictive behaviors. In a Korean study, the IAT detected significant problems with internet addiction in only 42% of the clinical subjects. IAT scores did not vary across addiction severity levels, and there was no association between IAT scores and duration of addiction (Kim, Park, Ryu, Yu, & Ha, 2013). Therefore, although our meta-analytic findings do represent an estimate of the magnitude of the actual problem of internet use, we caution against interpreting them as the measure of addiction to internet use.

This review had its own limitations. The high level of heterogeneity among studies decreased the confidence in the pooled estimates despite the adoption of a random effect model. This review pertained to studies that used a specific instrument (i.e., Young's Addiction Test); therefore, its scope was narrow in the absence of studies that used a different but valid assessment tool for IA. This review did not evaluate unpublished data on IA or articles published in Arabic due to an inability to identify them.

Recommendations

In light of this review's findings, we recommend that IA research in this region focus on improving a number of aspects, for example, multi-city studies with more representative samples. Additionally, important factors such as family structure, religiosity, and family atmosphere need to be evaluated as potential correlates of IA. Finally, GCC researchers should design and conduct interventional studies that target primary prevention of IA among adolescents and young adults.

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Authors' contribution: AMA designed the search strategy, did data extraction and data analysis, assessed study quality, and prepared the original draft. JS supervised the data analysis, arbitrated any discrepancies, and reviewed the manuscript; AMR did the literature search and assessed study quality; MAK did the literature search and data extraction. AA wrote, reviewed and edited the manuscript; NS conceived the study and reviewed and edited the manuscript.

Conflict of interest: The authors declare no conflict of interest.

Ethics: Not applicable.

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SUPPLEMENTARY DATA

Supplementary data to this article can be found online at <https://doi.org/10.1556/2006.2021.00057>.

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