Research Paper

Phantom Pain, Mental Health Problems, and Depression Among Yemenis With Amputated Limbs: Victims of the Recent Conflict

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ABSTRACT

Background: With the rise of global unrest and conflict around the world, the cases of amputation are increasing, leading to disruptions in mental health, social values, vitality, body image, and fitness. This study aims to evaluate the prevalence of phantom pain, mental health problems, and depression among Yemeni victims of the recent conflict with amputated limbs.

Methods: This descriptive cross-sectional study was conducted at the King Salman Center for Relief and Humanitarian Aid in Taiz, Yemen-2023. A convenience sample of 60 adults with amputated limbs participated in this study. The general health questionnaire (GHQ-28) and Beck depression inventory-II (BDI-II) were used to collect the data. The data were analyzed using frequencies and percentages for descriptive statistics; chi-square and ANOVA were also conducted in SPSS software, version 25 at a significance level of $P<0.05$.

Results: Regarding the demographic and clinical characteristics, the majority of conflict victims were male (88.3%), young (63.3%≤30 years old), and without chronic diseases (88.3%). The prevalence of phantom pain (76.7%), the probability of mental health problems (61.7%), and the rate of depression (58.3%) are high among amputees. There was a direct relationship between the presence of phantom pain and mental health problems ($P=0.032$), suggesting that individuals experiencing phantom pain are more likely to report mental health issues. However, no significant relationship was found between different levels of phantom pain and the probability of mental health problems or depression ($P>0.05$).

Conclusion: Victims of conflict-related amputation face serious mental health problems associated with complex trauma and disability, which shows the strong need of these people for psychological support. Therefore, it is recommended that the rehabilitation team assess their mental status regularly, identify the people at risk, and perform the necessary interventions.

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Highlights

- Conflict-related amputation resulted in a high prevalence of phantom pain (76.7%), mental health issues (61.7%), and depression (58.3%) among Yemeni amputees.
- The majority of victims were young males (<30 years) and free from chronic illness, indicating a population requiring long-term psychological support.
- A significant relationship was found between the presence of phantom pain and mental health problems.
- However, no significant relationship was found between different levels of phantom pain and the prospect of mental health problems or depression.
- The findings underscore the need for psychological intervention and regular mental health screening for conflict-related amputees.

Plain Language Summary

This study investigates how losing a limb in conflicts affects the mental health of the survivors in Yemen. Many individuals who have lost a limb reported feeling pain in the limb that is no longer there, called phantom pain. This sensation affected most victims in this study, and over half also faced mental health challenges and depression. The research highlights that these amputees, primarily young men, are dealing with significant mental strain in addition to physical pain, even though many are otherwise healthy. This study showed a significant relationship between the presence of phantom pain and mental health problems. However, different levels of phantom pain are not associated with feelings of depression or mental distress. The findings emphasize the importance of mental health support for those who have experienced traumatic injuries in conflict areas.

Introduction

With increasing global unrest and conflicts worldwide, the cases of amputation are rising, resulting in broken health systems and a fragmented continuum of care (Barth et al., 2021). Amputation disrupts an individual's social values, impacting their sense of vitality, body image, and fitness, and can often be perceived as a sign of personal loss or failure (Stancu et al., 2016).

The data on war-related amputations and injuries among Yemeni civilians is based on findings from a study of 254 patients treated at the Omani National Trauma Center. This retrospective cohort study documented injuries from 2015 to 2017, showing that blast (63%) and gunshot wounds (29%) were the primary causes, leading to traumatic amputations in 5% of cases and permanent disabilities in 50% (Ramaraj et al., 2023).

Amputation is a significant concern around the world. In 2017, it was estimated that 57.7 million people were living with an amputated limb due to trauma (McDonald et al., 2021). Unfortunately, these injuries are becoming increasingly common in wartime; for example, as of January 2023, over 40000 Ukrainians have been injured in the recent war, and it is estimated that up to 33% of injuries result in amputations (Tomilenko, 2023).

Yemen had the highest disability burden, measured by years lived with disability, among 195 countries (Vos et al., 2017). Thousands of people have lost limbs in Yemen since the conflict started in 2015. The United Nations (UN) estimates that about 2.2% of people in Yemen have at least one disability (Ngo & Bjork, 2018). The health care system in Yemen collapsed due to war. According to the UN, only 50% of health care facilities are fully functional, and more than 80% of the Yemeni population faces significant challenges in reaching health care services (OCHA, 2021). Explosive weapons cause more severe and complex disabilities, such as amputations and spinal cord injuries (Humanity & Inclusion, 2017). Millions of landmines and remnants of war remain in Ukraine, Yemen, Syria, Afghanistan, and other contaminated areas, putting people's lives and work at risk (Loddo, 2022).

Amputation negatively impacts function, sensation, and body image, leading to financial difficulties, isolation, and low self-esteem. Post-amputation pain and suffering can also disrupt personal relationships, including marriage (Gilg, 2016). While mental health comorbidity is prevalent in amputees (Muzaffar et al., 2012), the majority of them have not received comprehensive care that includes psychological management (Barth et al., 2021).

A narrative review study that included research from the United States, France, Canada, Italy, Germany, Denmark, Japan, and the United Kingdom, among others, shows that phantom limb pain (PLP) is experienced by up to 87% of amputees. It is a complex phenomenon characterized by pain sensations such as stabbing, throbbing, burning, or cramping in a limb or organ that has been removed, commonly following amputation. As a result of unknown causes involving both central and peripheral nervous system changes—such as cortical reorganization and neuroma formation—a personalized approach is required due to the lack of a single gold-standard treatment. This approach may combine various therapies, including pharmacologic treatments like opioids, n-methyl-D-aspartate receptor antagonists like ketamine, antidepressants, and other treatments such as mirror therapy, motor imagery, and targeted muscle reinnervation (Culp & Abdi, 2022).

It has been shown that PLP could be triggered and exacerbated by psychological factors such as stress (Fuchs et al., 2018). However, Katz (1993) suggested that while amputees suffering from PLP exhibited higher than normal levels of psychological and emotional distress, including depression, it did not imply a causal relationship. The consensus is that there is no difference in the prevalence of pain of psychological origin among amputees and the general population. Therefore, phantom pain and depression may co-occur, but one is not necessarily the cause of the other.

Recovery from traumatic amputation needs to be comprehensive and coordinated and requires addressing the personal's physical, psychological, and socioeconomic needs within the context of family, community, and the sociocultural environment in which they live (Ferguson et al., 2004). Furthermore, awareness of the co-morbid psychiatric disorders in amputated patients can be invaluable in proper management and preventing further chronic debilitating disorders associated with amputation (Muzaffar et al., 2012).

To the best of our knowledge, no prior study has examined the prevalence of phantom pain and the effect of amputation on the mental health and mood state of Yemenis with amputated limbs due to the recent conflict. Therefore, our study aimed to assess phantom pain, mental health problems, and depression among amputee victims of the recent Yemeni conflict.

Materials and Methods

Design, setting, and sample

A descriptive cross-sectional research design was utilized to fulfill the research aim. This study was conducted in Taiz, where King Salman Humanitarian Aid & Relief Center (KSrelief) established and operated the Artificial Limbs Center over three phases: Producing a wide range of prosthetic devices, providing physical and psychological rehabilitation for patients, and meeting patients' medical and non-medical needs. To date, 8530 patients have received services at the Taiz Center through the support of KSrelief (Qahtani, 2021).

A convenience sample of 60 adult patients with amputated limbs admitted to the above-mentioned setting were recruited to participate in this study. There are no official statistics on the number of amputees due to the recent conflict; however, according to media sources, the number of amputees between December 2014 and December 2016 (the period of intensified conflict in Taiz) reached 274 cases (Sky News Arabia, 2018). The sample of 60 cases was chosen due to practical constraints and the limited time available. Patients who met the following criteria were eligible for the study: Consent to participate, age 18 years and older, ability to communicate, amputation due to recent war, and no cognitive impairment.

Instruments

The data were collected using a sociodemographic and clinical data sheet, general health questionnaire (GHQ-28 items), and Beck depression inventory-II (BDI-II).

Sociodemographic and clinical data sheet

The researchers developed this sheet after reviewing the relevant literature (Ali & Haider, 2017; Ngo & Bjork, 2018; Nizamli, 2020). For pain level determination, we reviewed and relied on the studies by Roullet et al. (2009) and Graziottin et al. (2022). This sheet was attached to the tools used in the study and consisted of two parts:

Part 1 covers sociodemographic data, including the respondent's age, gender, marital status, level of education, residence (classified as urban or rural), and occupation.

Part 2 covers clinical data, which includes the type and date of amputation, presence of phantom pain, description and level of phantom pain (assessed using a visual and verbal pain scale: 1-3 for mild pain with minimal impact on activities of daily living [ADLs], 4-6 for moderate pain with moderate impact on ADLs, and 7-10 for severe pain with significant implications on ADLs). It also collects information on permanent medications, the probability of mental disorders, and depression status.

GHQ-28

This tool, which was developed by Goldberg & Hillier (1979), has 28 items in four subscales: Somatic symptoms, anxiety and insomnia, social dysfunction, and severe depression. Each subscale has 7 items, rated on a 4-point Likert scale (0: Never; 1: Almost never; 2: sometimes; 3: Often), and the maximum possible score on the questionnaire is 84. To differentiate the studied subjects with mental health problems from those without problems, a score of 23 and above indicates a mental health problem, and a score below 23 indicates no mental health problem. The Arabic version of GHQ-28 was used in Saudi Arabia and Lebanon and was valid and reliable, with a Cronbach α reliability estimate of 0.89 (Alhamad & Al-Faris, 1998).

BDI-II

This tool is a 1996 revision of BDI. It is widely used to assess the severity of depression (Beck et al., 1996). BDI-II contains 21 questions, each with four answers scored on a scale of 0 to 3, resulting in a total score range of 0 to 63. Lower total scores indicate more severe depressive symptoms during the past two weeks. The Arabic version of BDI-II was used in Qatar, Egypt, and most Arabic countries and was valid and reliable, with Cronbach α values ranging between 0.82-0.93 (Alansari, 2006; Naja et al., 2019). The scores of a depression state on the BDI were categorized as follows: 0-5 indicating "non-depressed," 6-11 "marginal depression," 12-22 "simple depression," 23- 30 "moderate depression," 31-40 "severe depression," and 41-60 indicating "more severe depression."

Results

Table 1 shows the sociodemographic characteristics of the studied subjects. It appears from this Table that the majority of adults with amputated limbs due to the recent conflict in Yemen are less than 30 years old (63.3%). The highest percentage are males, 88.3%, and married, 68.3%. Regarding educational level, more than a third of the study population (36.7%) have a secondary education. Moreover, more than two-thirds of the studied subjects (70.0%) live in urban areas. Concerning subjects' occupations, 60% are military, and 40% are civilian.

Table 2 displays the clinical characteristics of the studied subjects. Concerning the type of amputation, about 80% of the patients have lower limb amputation, and more than three-quarters of them (83.3%) lost their limbs before 2019. About the presence of phantom pain, 80% of the participants suffer from it, and one-half of them have severe pain. Considering physical health, most studied subjects (88.3%) are free from chronic diseases. Regarding the mental health of the studied subjects, this table indicates that 61.7% might have mental health problems, and almost all the studied subjects (93.4%) have some degree of depression; 75.0% of them have marginal or simple depression.

Table 3 reveals the relationship between the studied subject's mental health problems and their sociodemographic characteristics. The table shows no statistically significant relationships between age, gender, education level, and residence of the studied subjects and the probability of mental health problems (P>0.05). On the other hand, it shows a statistically significant association between the likelihood of mental health problems and the presence of a partner and having military occupation, with P of 0.045 and 0.021, respectively.

Table 4 presents the relationship between the studied subjects' clinical characteristics and the probability of mental health problems. Among individuals with the likelihood of mental health problems, 25(67.6%) reported phantom pain, while 12(32.4%) did not. This finding suggests that individuals with phantom pain are more likely to experience mental health problems. However, there is no association between the place of amputation, date of amputation, level of pain and chronic diseases, and the probability of psychiatric disorders (P>0.05).

There were no statistically significant relationships between almost all subjects' sociodemographic characteristics and depression state. The only significant association was found in connection with gender and depression state (P=0.036), with the females having more severe depression than males. It is worth mentioning that there was no significant relationship between the clinical characteristics of the subjects and their depression state (P>0.05).

Table 1. Distribution of the studied subjects according to their sociodemographic characteristics

Sociodemographic Characteristics		No. (%)
Age (y)	18-23	14(23.3)
	24-30	24(40)
	31-36	8(13.4)
	>36	14(23.3)
Sex	Male	53(88.3)
	Female	7(11.7)
Marital status	Married	41(68.3)
	Single	17(28.3)
	Widow	2(3.4)
Level of education	Elementary	17(28.3)
	Preparatory	9(15)
	Secondary	22(36.7)
	University	12(20)
Area of residence	Urban	42(70)
	Rural	18(30)
Occupation	Civilian	24(40)
	Military	36(60)

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Table 2. The distribution of studied subjects according to their clinical characteristics

Clinical Characteristics		No. (%)
Amputation type	Upper	11(18.3)
	Lower	48(80)
	Both	1(1.7)
Date of amputation	2014-2016	21(35)
	2017-2019	29(48.3)
	2020-2022	10(16.7)
Presence of phantom pain	Yes	46(76.7)
	No	14(23.3)
Description of phantom pain	Abnormal angle	8(13.3)
	Electric	10(16.7)
	Existence of limb	28(46.7)

Clinical Characteristics		No. (%)
Level of phantom pain (n=46)	Mild	4(8.7)
	Moderate	19(41.3)
	Severe	23(50)
Presence of chronic disease	Yes	7(11.7)
	No	53(88.3)
Permanent drugs	Yes	5(8.3)
	No	55(91.7)
Probability of mental disorder	No	23(38.3)
	Yes	37(61.7)
Depression state	Nondepressed	4(6.7)
	Marginal depression	21(35)
	Simple depression	24(40)
	Moderate depression	7(11.7)
	Severe depression	3(5)
	More severe depression	1(1.7)

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Table 5 shows no association between the levels of phantom pain and the probability of the presence of mental health problems and depression, with P of 0.495 and 0.234, respectively.

Discussion

Limb loss as a devastating injury creates a significant health burden, affecting the physical and emotional well-being of victims, as well as impacting their families, society, and health care services (Sahu et al., 2016). In Yemen, amputation results mainly from a blast, a mine, or sustaining a gunshot. According to the American Center for Law and Justice (ACLJ), 75% of those affected by landmines will suffer permanent disabilities and lifelong psychological distress (Dashela, 2022). In this regard, this study was conducted to evaluate depression, phantom pain, and the probability of psychiatric disorders among Yemenis with amputated limbs as a result of the recent conflict.

Concerning the sociodemographic characteristics of the sample, most study victims were male and under 30 years old. This finding is congruent with studies conducted in countries facing civil conflicts. Previous studies in Syria and Pakistan concluded that most amputees are young and male (Ikram et al., 2014; Nizamli, 2020).

However, this finding is contrary to the finding in countries not suffering from civil conflicts, where the leading cause of amputations is physical diseases, such as diabetes mellitus and infection. For example, the average age of American amputees is 53.5±11 years (Petersen et al., 2023).

Unfortunately, young victims will live most of their lives with pain, disability, and psychological problems that undermine their quality of life. Accordingly, they require great attention to provide the best possible health care to reduce this suffering and enhance their quality of life. Younger participants in previous studies have shown limited acceptance of their new identity as amputees, and this has negatively impacted their self-esteem among family and loved ones (Akarsu et al., 2013; Weiss, 2013).

Regarding the clinical characteristics of the study subjects, the majority of war-related amputations involved the lower limb, and most patients had undergone amputation of one limb. This finding is congruent with an analysis of amputations that was conducted in 2016 in

Table 3. The relationship between studied subjects' sociodemographic characteristics and probability of mental health problems

Sociodemographic Characteristic		Probability of Mental Health Problem		Chi-square	P
		No (n=24)	Yes (n=36)		
Age (y)	18-23	2	12	6.693	0.082
	24-30	13	11		
	31-36	2	6		
	>36	6	8		
Gender	Male	22	31	1.939	FET=0.233
	Female	1	6		
Marital status	Married	20	21	6.214	0.045*
	Single	3	14		
	Widow	0	2		
Level of education	Elementary	6	11	5.375	0.146
	Preparatory	3	6		
	Secondary	6	16		
	University	8	4		
Residence	Urban	15	27	0.406	FET=0.571
	Rural	8	10		
Occupation	Civilian	5	19	5.182	FET=0.021*
	Military	18	18		

FET: Fisher exact test.
*Statistically significant.
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south Ukraine on the victims of actual combat conflict (Ie & Bespalenko, 2016).

However, almost all of the studied subjects were free from chronic diseases, which is related to the fact that most conflict victims were young and physically fit. Rehabilitative therapists should consider these advantages during the rehabilitation process. It has been shown that young amputees undergoing active physical therapy have better improvement in using prostheses and gait skills. Moreover, their musculo-articular and functional status will be enhanced, improving their psychoemotional state (Herasymenko et al., 2018).

Psychologically, the present study found that the likelihood of mental health problems, depression, and phantom pain was high among amputees. This finding is consistent with recent research on conflict victims in Uganda (Okello et al., 2022). Furthermore, this finding is consistent with another study that reported a prevalence of psychiatric disorders among amputees ranging from 32% to 84%, depression rates from 10.4% to 63%, and post-traumatic stress disorder (3.3% to 56.3%) (Sahu et al., 2016). Furthermore, the current study shows that the possibility of mental health problems and depression is common among amputees, even after years of amputation.

In the same context, previous studies (Ali & Haider, 2017; Khan et al., 2018) have concluded the same result. Ali & Haider (2017) examined psychological adjustment among 100 adult amputees in Peshawar, Pakistan, and found that factors like gender, age, and cause of amputation influenced adjustment levels. Nearly all participants experienced psychological maladjustment, with males and younger adults showing greater distress, while planned medical amputations led to fewer adjust-

Table 4. The relationship between the studied subjects' clinical characteristics and the probability of mental health problems

Clinical Characteristics		Probability of Mental Health Problems		Chi-square	P
		No (n=23)	Yes (n=37)		
Place	Upper limb	5	6	2.017	0.365
	Lower limb	17	31		
	Both limbs	1	0		
Date of amputation	2014-2016	8	13	0.408	0.815
	2017-2019	12	17		
	2020-2022	3	7		
Presence of phantom pain	Yes	21	25	4.467	FET= 0.032*
	No	2	12		
Level of phantom pain (n=46)	Mild pain	3	1	1.805	0.405
	Moderate pain	9	10		
	Severe pain	9	14		
	Total	n=21	n=21		
Chronic disease	Yes	3	4	0.069	FET=0.549
	No	20	33		

FET: Fisher exact test.
*Statistically significant.
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ment issues compared to unplanned accidental amputations. Similarly, Khan et al. (2018), in a systematic review of anxiety and depression following traumatic amputation, highlighted the high prevalence of mental health challenges among amputees and stressed the need for comprehensive rehabilitation to address these physical, psychological, and socioeconomic impacts. Moreover, according to another study, depression and anxiety are moderately high up to two years after amputation (Waqar et al., 2015).

As for depression, psychiatric disorders were still present after a considerable period of limb loss. This finding is supported by another study, which represented that more than half of the traumatic amputees in Gaza have reported psychological distress, with symptoms persisting for several years following amputation (Heszlein-Lossius et al., 2019). In the same context, lower limb injury is associated with significant psychological distress even years after amputation (McCarthy et al., 2003).

Most of the subjects in our study suffered from the presence of phantom pain, which is also shown in other related studies (Abdi, 2022; Sahu et al., 2016). In the same context, a longitudinal study reported these false sensations in 50%–85% of amputees, with varying in-

Table 5. Relationship between phantom pain levels and the means of GHQ-28 items and BDI-II

Variables	Mean±SD			F	P
	Mild Pain (n=4)	Moderate Pain (n=19)	Severe Pain (n=23)		
GHQ-28 items	19.50±11.85	28.84±15.57	28.43±14.12	0.716	0.495
BDI-II	12.00±10.71	17.5±11.99	12.65±6.84	1.503	0.234

GHQ-28: General health questionnaire; BDI-II: Beck depression inventory.
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tensity and duration (Margalit et al., 2013). Phantom pain is associated with feelings of depression (Murray & Forshaw, 2013) and mood dysregulation (Trevelyan et al., 2016) and predisposes the person to accidents (Senra et al., 2012). This aspect of amputation generates frustration and stress, and it can become a threat to the rehabilitation process and the psychological and physical well-being of the person (Roșca et al., 2021)

Our findings indicate a positive and direct relationship between the presence of phantom pain and mental health problems. This outcome suggests that individuals with phantom pain are at increased risk of experiencing mental health issues. This finding is consistent with the study by Hogan et al. (2022), which examined over 44000 patients with below-knee amputations and found that those with phantom limb syndrome had significantly higher rates of psychiatric comorbidities compared to individuals without documented phantom pain. However, in contrast to our study, there is another study that did not report any association between the presence or intensity of phantom pain and psychological problems (Gunterstockman et al., 2023). It has also been shown in a study that depression in younger amputees is not related to the presence of phantom pain (Padovani et al., 2015). Along the same line, another study indicated that depression and mental health may be associated with the disability itself rather than the presence of phantom pain (Whyte & Niven, 2001). The difference in the results could be due to the type of amputation, as in our study, most of the samples had lower limb amputations. Also, the impact of horrific war memories and other personal and social characteristics could play a role in the difference in results. The present study shows that the probability of the presence of mental health problems among amputees is higher in civilians than in veterans. This result might be attributed to receiving veterans' financial support. Many of them consider it as a sacrifice for their country, while civilians usually do not receive support, and their loss of a limb is accidental under being at the wrong place at the wrong time. This explanation is supported by previous studies that argue that amputees' spiritual beliefs play a crucial role in stabilizing their lives, providing meaning for the experience of disability, and assisting them in coping with the situations (Gündüz et al., 2024). Additionally, veterans receive financial support, contributing to their lower distress levels. This view is supported by another study showing that psychological distress is associated with reduced financial income after amputation and that the frequency of pain is higher among the poorest patients and increases with decreasing family income (Geiling et al., 2012).

Similarly, single patients in this study were at greater risk of developing psychiatric disorders than married patients. This finding explains the importance of family support. Previous studies have concluded that family support is the primary source of psychological strength among amputees (Abouammoh et al., 2021; Valizadeh et al., 2014). Therefore, rehabilitation centers should involve the patient's family members in educational programs to enable them to understand the psychological distress that disrupts the lives of amputees and to be able to help the patient overcome it or at least reduce it to improve the effectiveness of the rehabilitation process.

Limitations of this study include its cross-sectional design, which does not allow for causal relationships; self-report questionnaires may also have introduced bias, as some subjects may have under- or over-reported their phantom pain, depressive status, and mental health status. Potential issues related to sample size and generalizability, limited demographic diversity, and focus on specific populations may also impact the applicability of the findings to a broader group of amputees.

Conclusion

Victims of conflict-related amputation face serious mental health problems associated with complex trauma and disability. Therefore, rehabilitation professionals need to pay attention to psychiatric disorders and phantom pain experiences among patients with war-related amputation. However, being married and having a military job appeared to be protective against psychiatric disorders among amputees in the Yemeni war. Educating the family, caregivers, and peers about the physical and psychological needs of patients with amputated limbs is crucial for holistic care and improving the quality of their lives. To increase generalizability, the researchers suggest collecting data from a larger sample size and more diverse geographical locations in Yemen.

Ethical Considerations

Compliance with ethical guidelines

Official approval was obtained from the Dean of the Faculty of Medicine and Health Sciences and the directors of the KS Relief Center (Code: 2022-11-362). Consent was obtained from each subject after the study's purpose was explained. The anonymity, privacy, and confidentiality of the subjects were assured. Participation was entirely voluntary, and withdrawal from the study did not affect the care provided.

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Authors' contributions

Conceptualization, supervision, analysis, and writing the initial draft: Fuad Taleb, and Asmaa Altahari; Data collection: Morad Mohammed, Eman Alemrany, Enas AL-a'ameri, Hassam Alwageeh, Samah Alhijri, Ayat AlHamdany, Khadija Ahmed, and Aziza Alazazi Data entry, and writing: Morad Mohammed, Eman Alemrany, and Enas AL-a'ameri.

Conflict of interest

The authors declared no conflict of interest.

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