



Research Article

DEPRESSION PREVALENCE AMONG NURSES: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Depression is one of the most common mental health disorders globally, and is thus a major public health problem. It is a major cause of disability and contributor to the global burden of disease. Specifically, previous studies have shown that depression affects nurses and there are risk factors associated with it. Early detection is crucial to reduce the costs associated with depression.

Objective: This study measured the prevalence of depression and determined its risk factors among nurses.

Methods: A Cross-Sectional Study was conducted among 671 nurses working in hospitals. The Patient Health Questionnaire was utilized, which is a validated self-administered depression scale. Data concerning demographical characteristics and work-related variables were collected to assess risk factors associated with the prevalence of depression.

Findings: Among participants, 52% (350) experienced depression with diverse severity: mild (57%), moderate (29%), moderately severe (11%), and severe (3%). A multivariate analysis revealed varied predictors of depression: nationality, family history of depression, negative life events, job dissatisfaction, a long working week, little or no physical exercise, and working the night shift for two weeks or longer.

Conclusions: Depression is a critical issue among nurses. It can negatively affect their productivity. Therefore, providing mental health education and psychiatry specialists in each hospital is necessary to address nurses' psychological problems and meet their mental health needs. In addition, nurses needed to be continuously monitored by their superiors for detection of any work problems so that suitable solutions can be devised within a reasonable period.

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INTRODUCTION

Depression is one of most common mental health disorders globally (Global Burden Disease, 2016). It is characterized by sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, feelings of tiredness, and poor concentration (World Health Organization, 2016). According to the World Health Organization (WHO), approximately 350 million people globally experience depression, which is a major cause of disability and a contributor to the global burden of disease (World Health Organization, 2016). In 2013, major depressive disorder was the second most common cause of global disability, accounting for about 6.8% of the 'total years lived with disability'.

Moreover, it contributed to the global burden of disease with 2.11% of 'total disability adjusted life years' (Global Burden Disease, 2016). Depression can also lead to loss of relationships between patients and their relatives, friends, and colleagues. The consequences of depression might also negatively affect individuals' work and educational attainment. Several studies have been conducted around the world to estimate the prevalence of this problem and determine its possible causes.

Depression Risk Factors

According to the American Academy of Family Physicians, depression can be caused by several risk factors, which should be considered when screening patients. These factors include chronic medical illness, chronic minor daily stress, chronic pain syndrome, family history of depression, being a woman, low income or job loss, low social support, history of

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depression, marital status, having a traumatic brain injury, and being younger (Maurer, 2012).

However, it is possible that there are other factors related to the job environment that could contribute to the prevalence of depression among workers in different fields, such as healthcare providers such as nurses. Globally, some studies have estimated that the prevalence of depression among nurses was double that of the general population (18% and 9%, respectively) (Letvak, Ruhm, & McCoy, 2012).

Nurses might experience severe time pressure, especially when dealing with many patients with complex conditions. They are more likely to experience work-related stress and develop depression, which consequently will negatively affect the quality of their work. Workers who experience depression symptoms reported more lost productive time in comparison with non-depressed workers (5.6 hours/week vs. 1.5 hours/week, respectively) (Stewart, Ricci, Chee, Hahn, & Morganstein, 2003).

Aim

Our aim was to explore the levels of depression and the associated risk factors among nurses working in Makkah hospitals. Findings of this study can support target interventions such as establishing mental health programs for in-need nurses.

Objectives

This study measured the prevalence of depression and determined its risk factors among nurses.

LITERATURE REVIEW

In the U.S., a study (Letvak *et al.*, 2012) screened for depression symptoms among 1,171 nurses (91% women), finding a prevalence of 18% and body mass index, job satisfaction, the number of health problems, mental well-being, and health related productivity as the most significant risk factors (all $ps < .05$). However, the researchers did not address department type. Another American study (Welsh, 2009) with 150 medical surgical female nurses found that 35% of them experienced mild to moderate depression symptoms with somatic symptoms, major life events, and occupational stress as the significant risk factors (all $ps < .01$). However, generalizability is limited because 93% of the sample were Caucasian. Both studies were also limited by a cross-sectional design, which cannot provide a distinct view of trends. In addition, no data were collected relating to shift work, which was seen as a significant risk factor (odds ratio (OR) = 1.46, 95% confidence interval (CI): 1.42–1.78) of depression in 67 intensive care unit nurses in Brazil (Vargas & Dias, 2011). That study also found two other significant factors: marital status (OR = 1.56, 95% CI: 1.32–1.84) and long working hours (OR = 2.11, 95% CI: 1.7–2.6); however, the sample size was small.

In Taiwan, marital status and working rank were significant predictors of depression among 314 nurses in different medical units (Chiang & Chang, 2012). Specifically, the prevalence of depression among nurses working in internal and external medical wards was higher than those working in emergency rooms. However, this study had an unbalanced sample size across units, which limit its generalizability.

In China, with a high response rate (79.5%), a study of 1,437 nurses showed a depression prevalence of 61.7% (Gao *et al.*, 2012). A low job rank, over commitment, alcohol consumption, worse nurse–patient relationship, and higher education level were significant risk factors. Another Chinese study that had a low response rate (5%) was conducted in Hong Kong with 850 nurses and revealed that the prevalence of depression among nurses was higher than that of the general population, 35.8% and 13.3%, respectively (Cheung & Yip, 2015). That study determined that chronic illness in the past year, poor self-perceived mental health, marital status (divorced/widowed), job satisfaction, disturbance with colleagues, low physical activity levels, and sleep problems were associated risk factors.

In Saudi Arabia, a cross-sectional study was conducted with 715 nurses working at King Fahad Medical City in Riyadh city, which found that 25% of the participants experienced depressive symptoms (Abbas *et al.*, 2012). This study determined a significant association between depression and sex, marital status, nationality, physical activities, and smoking. Arab nationality nurses were more likely to experience depression symptoms (30.7%) than other nationalities. Moreover, being a male nurse was significantly associated with depression. In addition, smokers had more depression symptoms than did non-smokers (31.7 and 7.6% respectively). The prevalence of depression among non-active nurses (12.8%) was higher than it was for active nurses. Furthermore, widowed and divorced nurses had a higher prevalence of depression (18.2% and 10%, respectively) compared to married or single nurses.

In past research, prevalence was screened by different types of depression scales such as the Patient Health Questionnaire-9 (PHQ-9) (Letvak *et al.*, 2012), the Beck Depression Inventory (Vargas & Dias, 2011), the Depression Anxiety and Stress Scale (Cheung & Yip, 2015), and the Center for Epidemiologic Studies Scale (Gao *et al.*, 2012), which was used by most studies. In addition to variations in sample sizes and departments, it is possible that uses of different depression assessment tools might lead to different prevalence estimations.

Rationale

Depression is predicted to be the second most cause of ‘total disability adjusted life years’ by 2020 (Murray & Lopez, 1997). In the U.S., cases of major depressive disorder increased from 13.8 million adults in 2005 to 15.4 million adults in 2010 (Greenberg, Fournier, Sisitsky, Pike, & Kessler, 2015). As discussed before, nurses may be more prone to depression. The impact of nurses’ depression affects work productivity and the economy. In the U.S., between 2005 and 2010, major depressive disorder cost the economy 210 billion dollars: This costs related to workplace cost (50%), direct cost (medical services) (45%), and suicide (5%) (Greenberg *et al.*, 2015). Therefore, large efforts should be implemented to minimize the incidence of this disorder among nurses. This can be achieved by determining the prevalence of depression and its related risk factors to help policymakers devise appropriate strategies. Unfortunately, in Saudi Arabia, only one known study has examined these issues in a tertiary hospital in Riyadh city (Abbas *et al.*, 2012). Nurses comprise more than 50% of healthcare workers in the Ministry of Health (Ministry of Health, Saudi Arabia, 2015); therefore, nurses must be

provided with a suitable work environment and strategies to prevent depression and its risk factors.

Early detection is crucial to reduce the costs of depression. Hopefully, this study will shed light on the needs of Ministry of Health nurses and aid stakeholders in organizing interventional mental health programs, which can detect and support this high-risk group in the workplace and in the community.

Methods

Design

This was a cross-sectional study that was conducted from January 2016 to February 2017.

Area Profile

The Kingdom of Saudi Arabia

The Kingdom of Saudi Arabia is located in southwest Asia. In 2015, according to the Ministry of Health, the total number of nurses in all health sectors in Saudi Arabia was 172,483 (38.3% Saudi). The total number of nurses working in the Ministry of Health was 95,379 (60% Saudi) (Ministry of Health, Saudi Arabia, 2015).

Study Area and Target Population

Makkah is a holy city located in the western region of Saudi Arabia. Healthcare is provided either by governmental or private institutions, including 10 Ministry of Health hospitals (seven inside the city). In Makkah, in 2015, there were 6,255 nurses, 82% (n = 5,154) were working in Ministry of Health hospitals, 968 were working in Ministry of Health healthcare centres, and 133 were working in regional health directorates. The ratio of female to male nurses was approximately 4:1 (78.5% women (n = 4,044) versus 21.5% men (n = 1,110) in Makkah Ministry of Health hospitals (42% Saudi) (Ministry of Health, Saudi Arabia, 2015).

Study Tool

A self-administered questionnaire that comprised two parts was utilized.

Part I: Participants' Basic Characteristics

Twenty-five questions concerning nurses' socio-demographic and basic characteristics were asked: age, sex, marital status, education level, presence of chronic diseases, history of depression, body mass index, negative life events, and physical exercise. Moreover, work-related information was sought such as years of experience, medical department, job satisfaction, working hours, days off, monthly salary, experience working the night shift, and job rank.

Part II: PHQ-9

The second part assessed depression severity using the valid and reliable (Kroenke, Spitzer, & Williams, 2001) PHQ-9. This questionnaire consists of 9 items, which are answered using a 4-point Likert scale (0 = *not at all*, 3 = *nearly every day*) (total possible score = 27) was divided into five categories according to depression severity: no depression (0-4), mild depression (5-9), moderate depression (10-14), moderately severe depression (15-19), and severe depression (20-27) (Kroenke & Spitzer, 2002). The scale's Cronbach alpha is > 0.80 (Kroenke *et al.*, 2001). Moreover, excellent test-retest reliability (r = .84) was previously shown between

the self-administered questionnaires completed in the clinics by the patients and the questionnaires administered by mental health professionals over the phone within two days (Kroenke *et al.*, 2001).

Variables

Independent variables

The independent variables included possible risk factors of depression.

Socio-demographic factors

We examined the following variables: age (continuous variable), sex (male, female), educational level (diploma, bachelor\masters\PhD), negative life events (death of relative or relative with serious disease) (yes, no), body mass index (underweight, normal, overweight, and obese), nationality (Saudi, non-Saudi), marital status (never married, married, divorced\separated\widowed), children (yes, no), monthly income (0-4,999, 5,000-9,000, ≥10,000 Saudi riyal), physical exercise (none; one, two, or more days per week), history of chronic diseases (yes, no), and history of personal or family depression (yes, no).

Work-related factors

We examined the following variables: medical department (emergency room, intensive care unit, surgical, medical, other wards), job satisfaction (dissatisfied, satisfied), working hours (45 hours, more than 45 hours), years of experience (less than 5 years, 5-10 years, more than 10 years), job rank (basic, head nurse), days off per week (two days, less than two days), and monthly night shift in week (none, once per month, two or more weeks per month).

Dependent variable

The dependent variable was depression. The outcome was dichotomous; either nurses either had depression (total score ≥ 5) or did not (total score < 5). Severity levels were categorized as follows: mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27).

Sample Size

We calculated sample size based on the prevalence of depression among nurses equal to 25% (Abbas *et al.*, 2012). Assuming a 95% confidence level with a 5% margin of error, the minimum sample size was 288 [$1.96^2 * 0.25(1-0.25)/0.05^2$], which was increased to 1080 to represent 50% of the total nurse population and proactively predict a possible weak response. Therefore, participants comprised 1080 nurses (50% of the total population from the four hospitals included in the study (n = 2160)).

Sampling Method

A two-stage random sampling method was used.

First Stage

Four hospitals were randomly selected from seven hospitals in Makkah city by simple random sampling

Second Stage

A stratified random sampling technique was used to select participants according to nurses' population size and distribution in each department and hospital. The number of selected nurses from each hospital was stratified proportional

to the size of the nurse population in each department. It was important to ensure that the selected sample covered all medical departments and all shifts in the hospitals.

Pilot Study

The study was piloted with 40 nurses who were excluded from the study sample and who worked in diverse hospital departments. The pilot study assessed study feasibility by estimating the time required to collect 40 questionnaires, the number of returned questionnaires, and the response rate. The pilot study was conducted over two weeks. Most nurses did not find any problems with the questionnaire; however, some found it difficult to understand; in these cases, the head nurse aided its completion.

Data Collection

A self-administered English-version questionnaire together with the informed consent form and cover letters were distributed all nurses. Seven-hundred fifty-one were returned (671 had no data missing, response rate 62.13%). Three-hundred twenty-nine nurses did not agree to participate and 80 nurses did not complete all parts of the questionnaire. Questionnaires were collected by head nurses before the end of nurses' shift in separate sealed envelopes for each participant to ensure confidentiality. Typically, the questionnaire took approximately 10 minutes to complete.

Data Analysis

STATA software version 13 was used for data analysis (<https://www.stata.com/company>). Variables were coded and a code book was saved. Mean and SD were used for variable descriptions. A student's t-test was used for comparing two groups with continuous variables. Frequency and percentage were used for description of categorical variables. For comparing groups with categorical variables, chi squared and Fisher exact tests were used. A stepwise logistic regression was used to measure the strength of the association between variables and determine the significant predictors of depression. Two-tailed tests with a significance level of $p < .05$ was utilized for all analyses.

Ethical Considerations

Participation was voluntary and the participants were informed that they had the right to withdraw from the study at any time. Informed, written consent was obtained from each participant and confidentiality and privacy were preserved throughout the study. Study protocol was reviewed and approved by the Institutional Review Boards (IRB) institutional review boards of the Faculty of Medicine and the research ethics committee at King Abdulaziz University. Moreover, approval to conduct this study in Ministry of Health hospitals was obtained from the Directorate of Health Affairs in Makkah city. Furthermore, nurses with moderately severe or severe depression were advised to seek medical care through their primary health-care centres or staffs' clinics.

RESULTS

Nurses' Basic Characteristics

Nurses' basic characteristics are shown in Table 1. Nurses' types of chronic diseases are shown in Figure 1.

Table 1 Nurses' sociodemographic characteristics (N = 671)

Variable	n	%
Age Mean (SD)	30 ± 6	
Sex	Male	50 7
	Female	621 93
Nationality	Saudi	236 35
	Non-Saudi	435 65
Marital status	Never married	305 45
	Married	328 49
	Divorced/separated/ widowed	38 6
Children	No	431 64
	Yes	240 36
Education level	Diploma	206 31
	Bachelor/Masters/PhD	465 69
	0-4,999 SR	229 34
Monthly Income	5,000-9,999 SR	357 53
	≥ 10,000 SR	85 13

Note. SR = Saudi riyal.

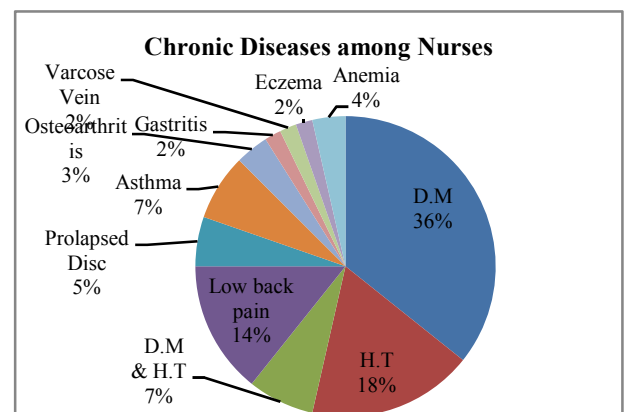


Figure 1 Nurses' chronic diseases

D.M: Diabetes Mellitus, H.T: Hypertension

Prevalence of Depression among participating nurses

Nurses' prevalence of depression are shown in Figure 2 (95% CI: 48.4-56).

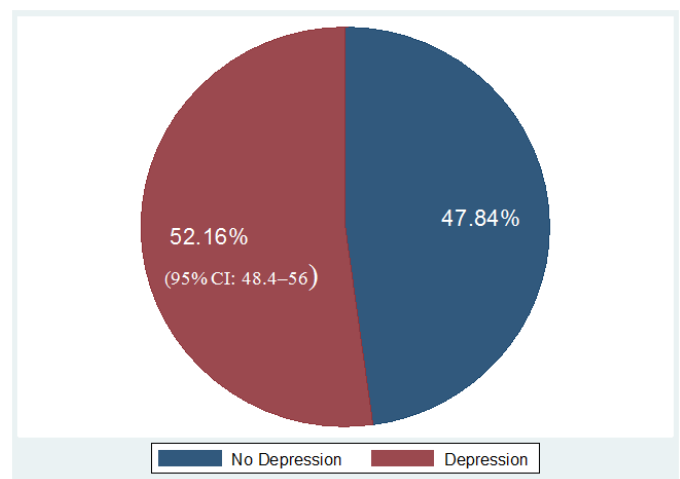


Figure 2 Prevalence of depression among nurse

Bivariate Analysis of Depression and its Associated Risk factors

The association between nurses' socio-demographic characteristics and depression is shown in Table 2. We found a significant association between depression and age (younger), nationality (Saudi), having children (no), educational level (higher), and monthly income (higher).

Table 2 Association between nurses' socio-demographic characteristics and depression

Variable	No depression n (%) (PHQ-9 score < 5) n = 321 (48%)		Depression n (%) (PHQ-9 score ≥ 5) n = 350 (52%)		p-value
	Age	Mean (SD)	31 (± 6)	30 (± 5)	
Sex	Male	21 (42)	29 (58)	.39 ^a	
	Female	300 (48)	321 (52)		
Nationality	Saudi	80 (34)	156 (66)	< .001 ^a	
	Non-Saudi	241 (55)	194 (45)		
Marital status	Never married	139 (46)	166 (54)	.23 ^a	
	Married	167 (51)	161 (49)		
Children	Divorced/ separated/ widowed	15 (39)	23 (61)	.05 ^a	
	No	194 (45)	237 (55)		
Educational level	Yes	127 (53)	113 (47)	.003 ^a	
	Diploma	8 (39)	125 (61)		
Monthly Income	Bachelor/ Masters/PhD	240 (52)	225 (48)	.05 ^a	
	0-4,999 SR	114 (50)	115 (50)		
	5,000-9,999 SR	177 (50)	180 (50)	.05 ^a	
	≥ 10,000 SR	30 (35)	55 (65)		

Note. SR = Saudi riyal; numbers (row % for all categorical variables); ^ap-value of chi-squared test; ^bstudent t-test.

The association between nurses' depression, personal and family history of depression, negative life events, and chronic disease is shown in Table 3.

Table 3 Association between nurses' depression, personal and family history of depression, negative life events, and chronic disease

Variable		No depression n (%) (PHQ-9 score < 5) n = 321 (48%)	Depression n (%) (PHQ-9 score ≥ 5) n = 350 (52%)	p-value
		History of personal depression	No	
	Yes	8 (17)	39 (83)	
History of family depression	No	311 (50)	312 (50)	< .001 ^a
	Yes	10 (21)	38 (79)	
Experiencing negative life events	No	256 (53)	224 (47)	< .001 ^a
	Yes	65 (34)	126 (66)	
Chronic disease	No	301 (49)	314 (51)	.06 ^a
	Yes	20 (36)	36 (64)	

Note. Numbers (row % for all categorical variable); ^ap-value of chi-squared test.

We found a significant association between history of personal depression, family depression, and experiencing negative life events and depression.

The association between exercise, body mass index, and depression among nurses is shown in Table 4.

Table 4 Association between exercise, body mass index, and depression among nurses

Variable		No depression n (%) (PHQ-9 score < 5) n = 321 (48%)	Depression n (%) (PHQ-9 score ≥ 5) n = 350 (52%)	p-value
		Physical exercise	Less than twice per week	
	2 times or more per week	209 (53)	185 (47)	
Body mass index (kg/m ²)	Underweight (Below 18.5)	22 (42)	31 (58)	.17 ^a
	Normal (18.5-24.9)	175 (51)	166 (49)	
	Overweight & Obese (≥ 25.0)	124 (45)	153 (55)	

Note. Numbers (row % for all categorical variable); ^ap-value of chi-squared test.

The relationship between work environment and depression among nurses is shown in Table 5.

Table 5 Relationship between work environment and depression among nurses

Variable		No depression n (%) (PHQ-9 score < 5) n = 321 (48%)	Depression n (%) (PHQ-9 score ≥ 5) n = 350 (52%)	p-value
		Department	Emergency room	
	Intensive care unit	72 (40)	109 (60)	
	Surgical ward	46 (45)	57 (55)	
	Medical ward	85 (56)	66 (44)	
Job rank	Others	49 (52)	46 (48)	.73 ^a
	Head nurse	19 (45)	23 (55)	
Years of experience	Basic nurse	302 (48)	327 (52)	.008 ^a
	< 5 years	132 (44)	165 (56)	
Job satisfaction	5-10 years	126 (46)	146 (54)	.008 ^a
	> 10 years	63 (62)	39 (38)	
	Dissatisfied	85 (35)	161 (65)	< .001 ^a
	Satisfied	236 (55)	189 (45)	

Note. ANW: antenatal ward, GW: gynaecologist ward, OPD: outpatient ward; Numbers (row % for all categorical variable); ^ap-value of chi-squared test.

The association between workload and depression among nurses is shown in Table 6. We found a significant relationship between depression and working hours, days off, and number of night shifts per week.

Table 6 Association between workload and depression among nurses

Variable		No depression n (%) (PHQ-9 score < 5) n = 321 (48%)	Depression n (%) (PHQ-9 score ≥ 5) n = 350 (52%)	p-value
		Working hours per week	45 hours	
	More than 45 hours	137 (42)	186 (58)	
Days off per week	Two days	261 (50)	259 (50)	.02 ^a
	Less than two days	60 (40)	91 (60)	
Number of night shift (weeks per month)	Less than two weeks/month	193 (53)	174 (47)	.007 ^a
	Two or more weeks per month	128 (42)	176 (58)	

Note. Numbers (row % for all categorical variable); ^ap-value of chi-squared test.

Multivariate Logistic Regression of Depression and its Associated Risk Factors

The multivariate logistic regression model for variables associated with depression among nurses is shown in Table 7.

Table 7 Multivariate logistic regression model for variables associated with depression among nurses

Variables	OR	p-value	95% CI
Nationality	Non-Saudi (ref.)	1	
	Saudi	2.02	< .001 1.41-2.90
Negative life events	No (ref.)	1	
	Yes	1.64	.009 1.13-2.40
Family history of depression	No (ref.)	1	
	Yes	2.2	.04 1.02-4.60
Physical exercise	Less than 2 times per week (ref.)	1	
	2 times or more	0.7	.04 0.51-0.98
Job satisfaction	Satisfied (ref.)	1	
	Dissatisfied	1.9	< .001 1.40-2.70
Working hours per week	45 hours (ref.)	1	
	> 45 hours	1.5	.02 1.05-2.04
Night shift (week/month)	Less than two weeks/month	1	
	Two or more weeks per month	1.6	.004 1.17-2.30

Note: ref: reference group

Nurses' depression severity

Nurses' depression severity levels are shown in Table 8 and Figure 3.

Table 8 Nurses' depression severity level per the PHQ-9 scale

Depression score	n	%	% among depressed nurses n = 350 (52%)
None (0–4)	321	48	0
Mild (5–9)	199	30	57
Moderate (10–14)	102	15	29
Moderately severe (15–19)	40	6	11
Severe (20–27)	9	1	3

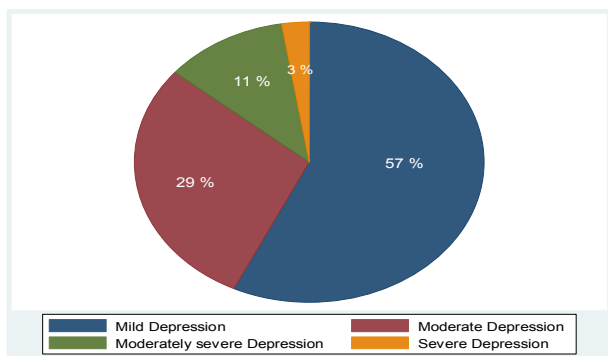


Figure 3 Nurses' depression severity level per the PHQ-9 scale

DISCUSSION

This study showed that more than half of the nurses experienced depression, which is double the result shown in a study conducted in Riyadh (Abbas *et al.*, 2012), but consistent with a study from China (Gao *et al.*, 2012). This could be attributed to the work environment of general hospitals. Tertiary hospitals usually have a limited and specific number of cases. In addition, they have implemented quality programmes that ensure staff member's demands are met.

The present findings showed a higher prevalence of depression among Saudi nurses, compared to non-Saudi nurses who were mostly from South Asia. This is in line with a study conducted in Riyadh, which found that Arab-nationality nurses experienced depression more than nurses from other nationalities (Abbas *et al.*, 2012). This could be explained by the fact that Saudi nurses were more empowered to declare their psychological health status. The current results showed a significant association between age and depression. Depressed nurses tended to be younger, which was consistent with Gao *et al.*'s (2012) examination of nurses in China. Generally, several studies have found that younger people are more likely to experience depression compared to older people (Bener, Ghuloum, & Abou-Saleh, 2012).

There was a significant association between nurses' education level and depression. Nurses with a higher education were more likely to experience depression, and this can be attributed to the fact that most of these nurses were Saudi. This was consistent with a past study (Gao *et al.*, 2012) that had double the sample size of the current study. The higher depression levels among more educated nurses might also be due to disappointing expectations concerning difficult jobs tasks.

The results also showed a marginally significant association between chronic diseases and depression. This result was consistent with a past study in China (Cheung & Yip, 2015).

Personal and family history of depression are typically considered two of risk factors that could lead to depression (Monroe, Slavich, & Gotlib, 2014).

Negative life events were significantly associated with depression in the current study. Nurses who experienced negative life events such as the death of a relative, having a family member with a serious disease, or getting divorced were two times more likely to have depression compared to nurses without negative life events. This was supported by Welsh (2009). Similar results were also obtained in a five-year cohort study conducted among the general population in Scotland (Phillips, Carroll, & Der, 2015).

Regarding physical activity, the present study showed a strong association between physical exercise and depression. It was considered a protective factor against depression. These results were consistent with another study that reported that physical exercise can decrease the prevalence of depression by as much as 25% among active nurses (Gao *et al.*, 2012).

Considering job satisfaction, depression was more prevalent among dissatisfied nurses. Several international studies supported our findings (Cheung & Yip, 2015; Letvak *et al.*, 2012). It is difficult to achieve optimum nursing effort if one is dissatisfied with his or her job condition. This might also be due to shortages in nursing staff and subsequent work overload. In addition, it may be due to unfair treatment from supervisors or a lack of appreciation from managers and hospital administrators.

Working the night shift was significantly associated with depression; nurses who work 50% or more of the months' night shifts were more likely to have depression than nurses with less night shifts. This finding is consistent with Vargas' study, which noticed the prevalence of depression among nurses was highest in those working the night shift (Vargas & Dias, 2011). In contrast to the current findings, studies conducted in Riyadh and China did not find any significant association between the night shift and depression. However, these studies did not consider the length of the night shift each month. A longer duration night shift could affect nurses' mental and physical health because they are more likely to be exposed to a boring, critical, and exhausting work environment. In fact, during the night shift, the lack of nurses could play a vital role in depression, because nurses might suffer from work overload. However, there were other factors associated with depression that were not significant in the final regression model: medical department, years of experience, and days off per week.

Regarding severity level, this study showed that more than half of the participating nurses experiencing mild depression, and more than one-third experienced moderate to severe depression. These results are consistent with the findings from Gao *et al.* (2012).

Strengths and Limitations

This study had some strengths. First, we used a questionnaire that was found to be reliable and valid. Second, our suitable sample size of 671 nurses came from diverse hospitals and departments. However, this study also had some limitations. First, the results cannot be generalized to all nurses because the sample did not include nurses working in primary healthcare centres or private hospitals. Second, the response rate was weak. It is possible that some nurses who refused to

participate experienced depression; however, they may have been afraid to disclose this to administrators, even though confidentiality procedures were explained and implemented. However, selection bias was not an issue because the characteristics of the non-responding nurses were like the characteristics of responding nurses.

CONCLUSIONS AND RECOMMENDATIONS

The current study showed that depression is prevalent among nurses working in hospitals in Makkah city. Several factors were significant predictors of depression including nationality, negative life events, less physical exercise, a family history of depression, job dissatisfaction, and long working hours. There was also a higher prevalence of depression in Saudi nurses than in expatriate nurses; however, the risk factors that cause depression were identical in both nurse groups. Therefore, the increase of depression prevalence in Saudi nurses may be related to risk factors that were not included in this study; consequently, there is a need for more studies addressing depression among Saudi nurses that consider risk factors related to their general characteristics and work environment. Other factors such as staff shortage, excessive workload, work shifts, long work hours, and irregular work schedules should also be evaluated to improve nurses' work conditions.

By elucidating all key factors, researchers can determine effective strategies for screening, diagnosing, and treating depressed nurses.

This study provides implications for Ministry of Health policymakers, who must find suitable solutions and increase health awareness for nurses about depression and its treatment. Novel strategies might reduce the prevalence of depression and improve nurses' work outcomes. Moreover, there is need for a mental health program that addresses nurses' psychological problems and mental health needs, including employee assistance support, local mental health counsellors, and psychiatric care services, which should be provided to all nurses who screen positive for depression. Furthermore, facilities that allow healthcare workers to exercise should be established in large hospitals or discounts should be provided at third-party gyms. This can help nurses and other healthcare workers improve their mental health and alleviate depression.

Contributors

All authors contributed to study concept and design, analysis, and interpretation of data, and the drafting of the article.

Declaration of Interest

Conflicts of interest: none. There are no financial or conflicts of interest to declare.

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Human Participation Protection

The study protocol was reviewed and approved by the biomedical ethical committee at King AbdulAziz University, Saudi Arabia (No.13606, 8/2/2016).

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