



Contents lists available at ScienceDirect

Journal of Radiology Nursing

journal homepage: www.sciencedirect.com/journal/journal-of-radiology-nursing

Prevalence of Depressive Symptoms and Associated Factors Among Radiographers in the West Bank Hospitals of Palestine: A Cross-Sectional Study

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A B S T R A C T

Keywords:
Depression
Radiology
West Bank
Radiographer

The radiographer is one of the most important and needful components of the workforce in the health care system. This study aimed to investigate the prevalence of depressive symptoms and explore its associated risk factors among radiographers working in the West Bank hospitals. A cross-sectional design was used for the study. Beck's depression inventory-II Arabic version was administered to respondents and Statistical Package of the Social Sciences (SPSS v 21) was used for the data analysis.

The prevalence of depressive symptoms among radiographers was (66.9%). The results showed a significant association between gender and depression; men were at higher odds of having higher depression categories as than women by 9.6 times (95% CI 3.65-22.4). In addition, radiographers who had no children were at higher odds to report higher depression categories than radiographers who had from one to more than five children by 8.9 times (95% CI 1.55- 52.02). In addition, the results showed that the radiographers who had bachelor degree were at higher odds of having higher depression categories than diploma and master or more radiographers by 2.4 times (95% CI 1.04-5.78). To work in private hospitals had lower odds of having higher depression categories than radiographers who work in government hospitals by 0.24 times (95% CI 0.17-0.51). The results showed a significant association between monthly salary and depression categories; radiographers who took monthly salary 1000-1199\$ were at higher odds of having higher depression categories than radiographers who took more than 2000US \$ by 2.5 times (95% CI 1.24-5.33). The radiographers who smoke were at higher odds of having higher depression categories than radiographers who did not smoke by 2 times (95% CI 1.08-4.18). Other variables showed no significant association with depression categories among radiographers.

Depressive symptoms among radiographers were found to be prevalent. Gender, number of children, education level, monthly salary, smoking cigarettes, work experience, and working sector were associated with the generation of depressive symptoms.

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Background

In accordance with the National Institution of Mental Health, depression is the most common mental disorder; it is a

psychological and physiological state caused by the integration of genetic, biological, physical, environmental, and psychological factors, often beginning in adulthood. It negatively affects how you feel, the way you think, act, and handle daily activities such as sleeping, eating, or working. Fortunately, it is treatable (US Department of Health and Human Services, 2015). Depression is one of the most spread problems worldwide; it has a great effect on life quality and productivity of workers (Wang, 2010) and can result in direct economic costs (Kudielka, 2005).

Globally as reported by the World Health Organization, more than 300 million people suffer from depressive symptoms, and it is the leading cause of disability. It is twice as common in women as in men. While its incidence increases with age in men, it decreases

We have no conflict of interest to disclose.

Conflict of interest: Authors of this article, Adnan Lutfi Sarhan, Ahmed Obaid, and Ali Abu Arra, confirm that there are no relevant financial or nonfinancial competing interests to report.

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<https://doi.org/10.1016/j.jradnu.2021.02.010>

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with age in women, at its worst, depression may lead to suicide (World Health Organization, 2018).

In the United States of America, an estimated (6.7%) of all adults, about (16.1) million people were depressed in 2016, (8.5%) are adult women compared with (4.8%) adult men (National Institute of Mental Health, 2016).

In the West Bank of Palestine, based on the Palestinian Ministry of Health Annual Report in 2016, the incidence rate of mood (affective) disorders was 11.1 per 100,000 of the total population. Besides, the total number of community mental health center visitors of mood disorders in the West Bank was 10553 with a prevalence rate of 359.5 per 100,000 of the total population (Palestinian Ministry of Health, 2016).

In the West Bank of Palestine, there are thirteen governmental hospitals and eleven private hospitals; the total number of medical imaging investigation in 2016 in government hospitals only was 1151796 tests (X-ray 1098688, computed tomography 117439, magnetic resonance imaging 15669) (Palestinian Ministry of Health, 2016).

In 2018, based on the Palestinian Medical Imaging Association statistics, the total number of radiographers in the West Bank was 985 of whom 207 were radiographers working in government hospitals and 133 in private hospitals, but the other radiographers were not working (Palestinian Medical Imaging Association, 2018).

Radiographers can be occupationally exposed to significant physical ionizing radiation hazards which affect the atoms in the living cells and damage the genetic material deoxyribonucleic acid. These absorbed, scattered, and ionized radiation photons will produce short-term side effects such as skin burns and vision impairments and may produce long-term side effects such as cancers and infertility (Griffin, 2006).

Working as radiographer may be prone to physical, emotional, and psychosocial stressful situations, and fear these side effects; for example, late effect, may affect life pleasure, concentration, thinking and decision-making, energy and productivity, and consequently may lead them to a state of depressive symptoms (Craciun, 2015).

Radiographers, such as many health care professionals, are highly stressed (Thomas, 2006). They have the burdens of diagnosing patients, high exposure to diseases, suffering and emergency, risk of infections, high job demands, understaffing, resources shortage, lack of control, overtaxing workload, time pressure, and lack of support from managers or senior colleagues (Tyssen, 2001), which lead to increase the risk of depression among radiographers and result in poor services delivery, less productivity, and increase the risk of medical errors (Firth-Cozens & Roy, 2000).

Methods

A descriptive cross-sectional design was used to achieve the aim of this study. A total of 985 radiographers make up the study population, and 340 of them were working. The distribution was 207 radiographers working in government hospitals and 133 working in private hospitals in the West Bank of Palestine, whereas the rest were not working, and most of radiographers in both sectors were men. Calculation of the sample was performed by using the formula ($n = N \cdot X / (X + N - 1)$), confidence level 95%, margin of error 5%, and sample proportion 50%; the minimum sample size needed is 181 (Daniel, 1999).

A convenient sampling technique was used to collect the sample. We visited thirteen radiology departments in governmental hospitals and eleven private hospitals in the West Bank to collect the sample.

Instrument

After approval of participation, the participants were asked to complete a self-reported questionnaire which contains two parts: the first part was about sociodemographic factors, and the second one was about translating Beck's Depression inventory (four items) scale, incorporating 11 questions with a maximum score of 63 and a minimum score of zero. The total score identified the level of depression. The Arabic version was prepared by Ghareeb, and the psychometric properties were assessed in 17 Arabic countries (Ghareeb, 2000). They have reported acceptable validity and reliability for BDI-11 in Arabic countries as investigated by Alansari, Cronbach's alpha ranged from 0.81 to 0.93 in these countries (Alansari, 2005).

Validity and Reliability of Beck'S Depression Inventory

Beck's Depression Inventory (Alansari, 2005) is considered to be valid and reliable for evaluating depressive symptoms. Regarding the Arabic-translated inventory that was used, it was tested in a study aimed to investigate the validity and reliability of Beck's Scale for depression among Kuwait University students. The results showed that the scale has achieved appropriate and high indicators of reliability and internal consistency using an alpha coefficient (Cronbach's alpha) value of 0.81 (Dahem, 2016).

Inclusion and Exclusion Criteria

- Available and accessible radiographers working on morning shifts were included.
- New radiographers (less than 1 year of experience) or those known with physical disabilities were excluded.
- Radiographers working in Jerusalem hospitals were excluded because there was no data available in medical imaging association records that were needed in the study.
- Those who refused to accept or complete the questionnaire form were excluded.

Data Collection Process

We visited all identified radiology departments in the West Bank on morning shifts, between Sunday and Thursday to ensure the participation of the largest sample in the study. Morning shifts include different radiographers from both genders who work during other daily shifts on other days and different imaging modalities. Radiographers were verbally invited to participate in the study. After the authors received their approval to participate, asked them to fill out the questionnaire. The interview was conducted face to face with the participants at the radiology department to trigger, motivate, and obtain correct answers from them; the interview lasted 10-30 minutes.

Statistical Analysis

Kolmogorov-Smirnov test was used to check whether the data had normal distribution or not, it was found to be (0.001), which means that the data were not normally distributed. Univariate analyses were used to explore the frequency of independent variables (age, gender, marital status, number of children, education level, working hospital, work experience, monthly salary, smoking cigarettes, Imaging modalities, residency, and physical disability). The generalized linear model by using ordered logistic regression analysis was used to analyze the factors associated with depression categories to the minimal depression among radiographers. We

considered the minimal depression variable as a referral factor when analyzed the regression, due to that all radiographers had at least minimal depression and there was no one free from depression symptoms.

Ethical Consideration

This study was performed in line with the principles of the Declaration of Helsinki. The study was ethically approved by An-Najah National University Institutional Review Board (Reference number 20/AP/0019). Informed consent was obtained from all individual participants included in the study.

Results

This section presents the study results. Part one shows the results of sociodemographic data, part two reports the prevalence of depression, and part three provides the results of the relationship between the depression categories and sociodemographic characteristics.

Table 1 showed the results of the distribution of demographic characteristics. The male participants outnumbered the female participants 131 (71.4%), versus 50 (27.6%), respectively.

Most of the participants were between 24 and 34 year old, and form (60.2%) of the study sample, most of them from the villages (48.6%), were married (75.7%), and have 1-5 children (42.5%). Most of the participants (83.4%) had a bachelor's degree. (63.5%) worked in government hospitals. (63%) of the sample had from 1 to 10 years of experience. (53%) of the sample received a monthly salary of 1000-1199\$. Regarding the existence of chronic diseases, smoking, and working on a night shift, the results showed that (95%) of the sample did not have diseases, (65.7%) were not smokers, and (56.4%) were working night shifts. The results showed that (74%) of radiographers were working on conventional X-ray modalities.

Table 2 showed that (33.1%) of radiographers complain from minimal depression which considered as baseline data, (22.1%) experienced mild depression, (19.9%) had moderate depression, and (24.9%) had severe depression; the prevalence rate of depression symptoms among radiographers was (66.9%).

Table 3 showed the results of the ordinal logistic regression analysis of factors associated with mild, moderate, and severe depressive symptoms among radiographers. The results showed a significant association between gender and depression; men were at higher odds of having higher depression categories than women by 9.6 times (95% CI 3.65-22.41). Besides, the number of children was significantly associated with depressive symptoms. Radiographers who had no children were at higher odds to report higher depression categories than radiographers who had from one to more than five children by 8.9 times (95% CI 1.55-52.02). In addition, the results showed that the radiographers who had bachelor's degree was at higher odds of having higher depression categories than diploma and master or more radiographers by 2.4 times (95% CI 1.04-5.78). To work in private hospitals had lower odds of having higher depression categories than radiographers who work in government hospitals by 0.24 times (95% CI 0.17-0.51). Working experiences per years (1-20) were at lower odds of having higher depression categories than radiographers who had more than 20 years of work experience by 0.10 times for the experience of 1-10 years (95% CI 0.01-0.91) and 0.23 times for radiographers who had 11-20 work experience (95% CI 0.07-0.81). The results showed a significant association between monthly salary and depression categories; radiographers who took monthly salary 1000-1199\$ were at higher odds of having higher depression categories than radiographers who took more than 2000US \$ by 2.5 times (95% CI 1.24-5.33). The radiographers who smoke cigarettes were at higher

Table 1

Distribution of participants in accordance with the sociodemographic characteristics

Variables	No (%)
Age	
24-34	109 (60.2)
35-45	40 (22.1)
≥46	31 (17.7)
Gender	
Male	131 (72.4)
Female	50 (27.6)
Marital status	
Single	44 (24.3)
Married or widowed	137 (75.7)
Number of children (if married)	
0 children	59 (32.6)
1 child	29 (16.1)
1-5	77 (42.5)
More than 5	16 (8.8)
Education level	
Diploma	19 (10.5)
Bachelors	151 (83.4)
Master and more	11 (6.1)
Type of hospital	
Private	66 (36.5)
Government	115 (63.5)
Work experience (years)	
<1	0
1-10	114 (63)
11-20	43 (23.7)
≥21	24 (13.3)
Monthly salary (USD)	
1000-1199	96 (53)
≥1200	85 (47)
Existence of physical disability	
No	181 (100)
Yes	0 (0)
Existence of chronic diseases	
No	172 (95)
Yes	9 (5)
Cigarette smoking	
No	119 (65.7)
Yes	62 (34.3)
Night shift working	
No	79 (43.6)
Yes	102 (56.4)
Imaging modalities	
X-Ray	134 (74)
Computed tomography	36 (19.9)
Magnetic resonance imaging	11 (6.1)
Residency	
City	73 (40.3)
Village	88 (48.6)
Refugee camp	20 (11.1)

odds of having higher depression categories than radiographers who did not smoke by 2 times (95% CI 1.08-4.18). Other variables showed no significant association with the depression categories among radiographers.

Discussion

Radiographers are prone to have poor mental and physical health. The psychologically unwell health care providers cannot

Table 2

Distribution of the sample in accordance with the level of depression symptoms

Level (Beck's score)	Frequency (%)
Minimal (1-13)	60 (33.1)
Mild (14-19)	40 (22.1)
Moderate (20-28)	36 (19.9)
Severe (29-63)	45 (24.9)
Total	181 (100)

Table 3

Ordered logistic regression for factors associated with mild, moderate, and severe depression compared with minimal depression among radiographers

Variables	B	SE	OR	(95% CI for OR)		p
				Lower	Upper	
Severe depression	0.276	2.125	1.31	0.02	84.88	.897
Moderate depression	1.689	2.128	5.41	0.08	350.23	.427
Mild depression	2.987	2.137	19.83	0.30	1307.33	.162
Gender						
Male	2.203	1.296	9.05	3.65	22.41	.001
Female	0a					
Age (scale)	-0.797	0.544	0.45	0.16	1.31	.143
Marital status						
Single	-1.146	0.734	0.32	0.08	1.34	.119
Married or widowed	0a					
N. of children						
0	2.194	0.897	8.97	1.55	52.02	.014
1	1.158	0.763	3.18	0.71	14.21	.219
2-5	0.749	0.599	2.12	0.65	6.85	.212
>5	0a					
Education						
Master or more	1.216	0.663	3.37	0.92	12.38	.067
Bachelor	0.895	0.439	2.45	1.04	5.78	.041
Diploma	0a					
Type of hospital						
Private	-1.145	0.378	0.24	0.12	0.51	.001
Government	0a					
Years of experience						
1-10	-2.263	1.107	0.10	0.01	0.91	.041
11-20	-1.455	0.635	0.23	0.07	0.81	.022
>21	0a					
Salary \$						
1000-1199	0.943	0.373	2.57	1.24	5.33	.011
>2000	0a					
Cigarette smoking						
No	0.755	0.345	2.13	1.08	4.18	.028
Yes	0a					
Night shift						
No	0.139	0.366	1.15	0.71	0.56	2.356
Yes	0a					
Imaging modalities						
X-ray	0.778	0.695	2.18	0.26	0.56	8.511
CT	0.194	0.703	1.21	0.31	4.82	.783
MRI	0a					
Residency						
City	0.445	0.496	1.56	0.59	4.12	.369
Village	0.790	0.501	2.20	0.83	5.88	.115
Refugee camp	0a					

B, coefficient; SE, standard error; *Statistically significant difference, $p \leq .05$; OR, odds ratio.

provide adequate medical services as their mentally healthy peers. Medical care providers with depression tend to depict poor work efficacy (Khuwaja, 2004).

Prevalence of Depressive Symptoms Among Radiographers

Our study demonstrated that depressive symptoms were common among radiographers. The present study found that the prevalence rate of depressive symptoms among radiographers working in both sectors in the West Bank of Palestine was (66.9%). The prevalence was higher than that found in the general population of Palestine as reported in the Palestinian Ministry of Health's annual report in 2016 (Palestinian Ministry of Health, 2016). This prevalence was comparable with the cross-sectional study among health care workers in the National Guard Hospital in Riyadh, Saudi Arabia. The prevalence rate of depression was found to be (11.4%) (AlFahhad, 2018). Another study examined the prevalence of depressive symptoms among Chinese doctors and was found to be (65.3%) (Wang, 2010).

In addition, a lower prevalence of depressive symptoms was reported among Korean nurses which was inconsistent with our study, and the prevalence rate was (38%) (Yoon, 2013).

The prevalence of depressive symptoms among nurses in Canada, France, and the United States of America ranged between (10% and 40%) (Letvak, 2011), which is lower than what our study found among radiographers as health care providers.

Another study was carried out by the US Department of Health and Human Services. The study looked at the rate of workplace depression from the year 2004 to 2006 in workers aged 28-64 years. The study found that health care practitioners and technicians came in third place with a depression rate of (9.6%), whereas in our study, (66.9%) of radiographers as health care workers had depression symptoms (Jane, 2006).

The prevalence of depressive symptoms among health care workers was found to be 48.1% (95% CI: 45.08%-51.16%). On the other hand, the prevalence among nurses was found to be 51.4% (95% CI: 47.87%-56.93%) which is higher than the doctors' 44.7% (95% CI: 10.64%-48.77%) (Claudia, 2003).

The lifetime and 1-month prevalence of major depressive episodes were found to be 14.3% and 10.6%, respectively, among the West Bank general population sample (Madianos, Sarhan & Koukia, 2011).

The relatively high prevalence of depressive symptoms among radiographers in the West Bank of Palestine may be attributable to various factors. The first factor consists of the shortage of radiographers with a heavy workload. Although the number of radiographers has increased in the West Bank hospitals in both sectors over the past few years, we still face a critical radiographer's shortage in hospitals. As per the Palestinian Ministry of Health annual report in 2016, the total number of radiography examinations was 594305 tests in governmental hospitals only, and the total number of radiographers working in the governmental sectors was 107 (Palestinian Ministry of Health, 2016). A large number of patients causes radiographers to have a heavy workload, where each patient requires movements and special positioning for each examination.

Factors Associated with Depressive Symptoms among Radiographers

Concerning age, the study showed no significant association between age and depression categories among radiographers. Our finding matched with a study conducted in the United Kingdom. It showed that no association was found between age and depression (Spearman's correlation coefficient 0.004) (Chambers, 1996). Another study showed that as age increased, the risk of depression decreased (Bjorvatn, 2011). A study conducted among nurses in Alexandria, Egypt, showed, unlike the general population, as nurses aged, they are less likely to suffer from depression and depressive symptomatology (Arafa, 2003).

We also found that the prevalence of depression was significantly associated with gender; men were 9.1 times more likely to report depression than women. Psychological distress concerning psychosocial work exposures was worse for men than for women (Vermeulen & Mustard, 2000). Interestingly, for our study population, not having children had a positive association with depressive symptoms. This might be due to the fear of having deformed embryos in the future. In spite that many studies reported there is no harm on fertility or fetus for men and pregnant women, such as Ratanplan et al., found in their study that there was no harm of x-ray for the pregnant woman and her fetus (Ratnapalan S, Bona N, Koren G; & Motherisk Team, 2003); radiographers in our culture, especially married couples, are still worried about the risk of radiation they are exposed to at work and are afraid of its effects on the reproductive system and on the formation of embryos.

Regarding marital status, our results identified no significant association between depression categories and marital status, although marital problems, separation, or divorce can certainly contribute to depressive symptoms. One study agreed with our

results and showing that those living alone or with partners had no significant association with depression levels (McCue, 2005).

We also found that the bachelor level of education had higher odds of having higher depression categories when compared with the academic level of diploma and master or more, among radiographers. A study explored that lower job levels, higher over-commitment, bad nurse-patient relationship, and higher educational level were positively associated with depressive symptoms among Chinese nurses; whereas, supervisor support, eating regular meals, and higher job satisfaction were negatively associated (Gao, 2011). Another study carried out by researchers that surveyed 118 health care workers at primary health care centers in three cities in the province of Ontario found that 30% of these workers had depression and had a significant association with low-education level (Franché, 2006). We found that some studies were consistent with our study, and others were not; may these differences had the origin that, in our Palestinian population the number of radiographers who have a master or more academic degree were very few, but the association still being significant for the radiographers who had bachelor academic degree.

We found that working in private hospitals had lower odds of having depression categories when compared with the variable of working in government hospitals. Our finding is inconsistent with a study that explored the association between the working sector and stress-related illness including depression. The study showed that radiographers working in the private sector were almost four times more likely to miss work due to a stress-related illness than those working in the public sector (OR = 3.75, 95% CI: 1.51-9.10) (Eslick, 2001). There are many factors related to political unrest in the area and increased prevalence of wounded West Bank Palestinian residents resulting in an increased referral burden on government hospitals and radiographers over the private hospitals.

We found a significant association between work experience and depression. A study carried out in the United States of America indicated that an annual average of 7% of full-time health care workers aged 28 to 64 years experienced a major depressive episode in the past year (Charles, 2005). Another study recruited 60 participants from paramedics, the majority of whom were men (77%), worked shifts, and between 5 and 10 years' experience had the higher prevalence (35% depression) (Balch, 2011). These studies' results are not consistent with our results which found that the depression categories have higher odds when the work experience increased more than 20 years.

Our study found that increasing the monthly salary, can decrease the level of depression, and also the respondents who smoke had more prevalence of depression categories than those who not smoke; these results matched the results of the study carried out in Palestine among the general population and found that the depression was more prevalent among poor and smoking cigarettes respondents (Madianos, Sarhan & Koukia, 2011).

Regarding, working the night shift, imaging modalities, and residency, the results showed that there was no association between them and depression categories.

Conclusion

This study was undertaken to measure the prevalence rate of depression among radiographers working in government and private hospitals in the West Bank of Palestine, and explore associated risk factors, based on a cross-sectional survey. Our findings revealed that most radiographers prevalent to depressive symptoms gender, number of children, education level, type of hospital, monthly income, work experience, and cigarette smoking were related to the development of depression categories. In this sense, it could be important for radiology managers, hospital administrators, and the

Ministry of Health to warrants immediate attention, further investigation, and interventions to improve the conditions of the mental wellbeing of radiographers working in both private and governmental sectors in the West Bank, Palestine.

Limitations of the Study

1. Men make up most of the sample which affects the significant differences in some variables and generalizability of the finding for female radiographers.
2. Most radiographers working in the private sector, especially those as part time were also working in government hospitals. We joined them in the sample but as full-time working in government hospitals only to prevent sample duplication.
3. Measurement errors were due to recall bias should be taken into consideration as the study is a cross-sectional one.
4. The non-normal distribution of a few demographic characteristics due to the convenient sampling technique is considered a limitation of the study and its generalizability. In addition, the self-reporting bias diminished the ability to increase the dissemination of the study.

Recommendations

1. Carry out additional studies to increase awareness, determine causes of depression, and develop coping mechanisms to reduce its effect on the life of radiographers in Palestine.
2. Develop strategies to improve the mental health of radiographers and other health care providers.
3. Improve working conditions especially in radiology departments such as reducing work pressure, improving medical imaging machines, strengthening safety procedures, strictly preventing radiation leaks, and adopting suitable environments at medical care hospitals in general.

CRedit authorship contribution statement

Adnan Lutfi Sarhan: Conceptualization, Methodology, Software, Formal analysis, Supervision. **Ahmed Obaid:** Methodology, Writing - original draft. **Ali Abu Arra:** Writing - review & editing.

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