

# Prevalence of Depression among Arab Women with Type 2 Diabetes: A Systematic Review and Meta-Analysis

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# Abstract

Objective: To systematically review and meta-analyze the literature estimating the cross-sectional prevalence of depression in Arab women with Type 2 diabetes in Arab countries. Design: Systematic review and meta-analysis of quantitative studies. Data Sources: The data were collected from scientific databases which included CINAHL, PubMed, Medic, ISI Web of Science, Cochrane library and ERIC published from January 2000 to May 2015. Sources used in all of the included studies were also reviewed. Results: Nine studies were included in the analysis. The criteria included studies that reported on Type 2 diabetes and depression co-morbidity in adult women from the following countries: Iraq, Jordan, Palestine, Qatar, Morocco, Saudi Arabia, Kuwait, United Arab Emirates, Oman, and Yemen. Conclusions: Prevalence rate of depression as comorbidity of Type 2 Diabetes Mellitus among Arab Women in the Arab countries is significant. Despite dearth of studies focusing on the association between depression and diabetes mellitus among Arab women, the prevalence rate revealed from the review merits attention for more gender specific exploratory studies on prevalence and management of these diseases.

# Keywords

**Diabetes Mellitus, Depression, Women, Arab Countries** 

# **1. Introduction**

Throughout the world, studies have been executed to assess the comorbidity of depression and diabetes [1]. The relationship between Type 2 Diabetes Mellitus (T2DM) and depression has been investigated by numerous re-

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searchers. Multiple studies have shown a relationship between T2DM and depression [2]-[4]. A meta-analysis study [5] concluded that depression is associated with a 60% increased risk of developing T2DM, and T2DM is associated with a modest increased risk of depression.

Worldwide, diabetes is a serious growing concern, as is depression. The World Health Organization has identified the Eastern Mediterranean (EMRO) countries as having one of highest prevalences of T2DM in the world [6]. In the EMRO region, the T2DM prevalence rate for all adults was 14.5%; however there are variations in distribution of the disease between and within countries. Gender appears to be a factor affecting variation in some countries. For example, in Bahrain women had higher rates of T2DM than men (24.4% for men and 35.9% for women); in Kuwait, the rates were almost equal (14.7% for men and 14.8% for women); and in Saudi Arabia, the T2DM rates were higher in men than in women (26.2% for men and 21.5% for women).

The prevalence of T2DM is expected to increase dramatically over the next 15 years in urban populations of developing countries [7]. More specifically, according to the International Diabetes Federation (IDF), the Gulf Region accounts for 5 of the top 10 countries with the highest prevalence rates of T2DM in the world [8]. This dramatic increase of T2DM prevalence over the last three decades in the Arab countries is very much parallel to the increase of industrial development due to the wealth generated by oil-rich resources in the Arabian Gulf [9]. While the trends of obesity, low glycemic control, and many other factors continue to grow, one can only predict that the future of diabetes is expected to vastly escalate in the Gulf area.

Depression is also prevalent worldwide, with more than 350 million people estimated to be inflicted with the condition [10]. It has been projected that in the year 2020, depression will be the second leading cause of death in the world [11]. The World Health Organization (WHO) concluded that the comorbidity of depression with a chronic illness incrementally deteriorates health outcomes as compared to having depression alone, or any chronic illness alone, or a multiple of chronic illness without the presence of depression [12].

While people with diabetes have been found to have doubled the risk for comorbid depression [13], no causal relationship has been established. As the relationships are still unclear they are described as bidirectional, where T2DM is a risk factor for depression and likewise depression is a risk factor for T2DM. It has been found that T2DM is associated with an increased risk of depression and anxiety disorders [14]. A 2013 study has found that T2DM was significantly more frequent in diabetic women than in control women [3] [15]. This higher prevalence of depression among females has been recorded by numerous studies [16]-[18]. The American Psychiatric Association found that the prevalence rate of depression in females was double the rate in males. The American Diabetes Association has concluded that women experience depression twice as frequent as men, and that depression increases in women with diabetes.

Perhaps the most under-researched demographic throughout most of the health literature is that of Arab women. Dearth of literature focusing on the health of Arab women has been found. The bifurcation of social life among men and women in the Arab countries imposed limited access to research community and restricted exploration mainly to the world of women [19]. This project sought to understand the current literature on comorbidities between depression and T2DM among Arab women in Arab countries. The prevalence of comorbid depression has been consistently significantly higher in diabetic women than in diabetic men [3].

## 2. Methodology

## 2.1. Review Questions

This study aimed to systematically review and meta-analyze the current comorbidity of diabetes and depression in Arab women living in Arab countries. The question for review was framed at the beginning of the project, and the study selection criteria were identified. Reasons for inclusion and exclusion of studies were articulated and recorded. The researchers decided to focus on the comorbidity of diabetes and depression in women living in Arab countries. One of the researchers is currently working with patients in an Arab country. During the course of the researcher's contact with patients, she observed a high proportion of female diabetic patients in health centers, who also suffered from depression. The Arab countries included were listed (Saudi Arabia, UAE, Bahrain, Palestine, Iraq, Jordan, Kuwait, Jordan, Oman, Qatar, Morocco, Syria, and Yemen). These countries were chosen as the women in these countries share many cultural and lifestyle similarities.

#### 2.2. Literature Search

The selection criteria was applied in the screening of all the literature found. This was done by defining the

terms, completing the searches individually, and then reading all of the abstracts. The full articles were then retrieved and selected those articles that fit the selection criteria. The following bibliographic databases were searched, using the EBSCO Academic Complete interface: Academic Search Complete, MedLine Complete, and CINHAL plus with full text. After the initial search, the research team repeated the search using Web of Science. No additional articles were found.

#### 2.3. Data Extraction

Data extraction forms were developed, based on those produced by the Cochrane Collaboration [20]. A file of completed data extraction forms for each article included was produced.

#### 2.4. Quality of the Data

Included study designs were cohort and cross-sectional studies. The researcher looked for completeness and quality of the data by comparing the recruitment strategies, the representative of the sample, the diagnosis of both "diabetes" and "depression", and stratification by gender.

#### 2.5. Statistical Analysis

The incidence rate of depression cases among the Arab female T2DM clients was treated as discrete variables. The prevalence rate and accompanying 95% confidence intervals were pooled using random-effects model in Comprehensive meta-analysis (CMA) versions 3. The number of depression cases was extracted from the cross sectional studies included in this review (**Table 1**). Furthermore, Statistical heterogeneity was assessed in this review using I2 statistic.

#### **3. Results**

Overall, 40 articles were identified for potential inclusion in the review using EBSCO Academic Complete. A secondary study with the same search words was then completed using Web of Science. That search yielded 13 studies. None of those studies were unique. Therefore, the original 40 articles were screened for inclusion (Figure 1).

The data extractors rejected 36 records for the following reasons: the article did not include T2DM, the participants were not adults, the participants were not Arab, the articles were not original research (but were review articles). Data extraction sheets were filled out on 9 studies [16] [17] [21]-[27].

After filling the data extraction sheets, the researcher extracted 9 studies, which were identical (Table 2).

Of the nine (9) studies, four (4) studies measured depression on diabetics using the Beck Depression Inventory, two (2) studies used the HADS, one (1) used the K6 depression and anxiety screening tool, one (1) used a 30 question self-administered questionnaire called the geriatric depression scale, and one (1) used the Center for Epidemiologic Studies Depression Scale (CES-S). Five of the nine studies used A1C testing, two studies accepted a previous clinical diagnosis, and two studies used both clinical diagnosis and A1C. The mean ages of the studies varied. One study specifically recruited people over 60 [16]. Six studies recruited mainly people in middle age [17] [23]-[27]. The other two studies recruited younger people [21] [22].

On prevalence of depression comorbidity between genders, four studies used the Beck Inventory. This tool picks up the presence of depressive symptoms that are mild extreme. Of the two studies that looked at HADS, the percentage of participants with comorbid diabetes and depression symptoms were fewer (23.4% and 19.3%). One study used Center for Epidemiologic Studies Depression Scale (CES-S) with 58.2%. In all studies that compared men with women, there was a significant difference between the two, with diabetic women having significantly higher rates of depression. More studies should be carried out in this area to confirm these findings.

#### **Quantitative Data Synthesis**

Upon statistical analysis, all the studies (9) included in this review that assessed the prevalence of depression among T2DM clients in Arabic countries were combined in the random-effect model using Comprehensive Meta-analysis Version 3. Statistical heterogeneity result using I2 statistic was more than 75%. Therefore, random effect model was used to estimate the prevalence of depression among T2DM clients.

	5	2			
Author, year, country	#Total; #Female (%)	Participant age	Number of depression (%)	Diabetes assessment	Depression assessment
Bener <i>et al.</i> , 2012, Qatar	1660; 893 female (53.8%)	Females mean age was 35.8	23.4% of women with depressive symptoms had DM	Self-reported DM type 2, a file the clinic, and HbA1c at the clinic	Hospital Anxiety and Depression Scale (HADS), HADS-A measured anxiety and HADS-D measured depression.
Hawamdeh et al., 2013, UAE	182; 182 female (100%)	71.5% were 18 - 39	64 (76.9%) of women who had DM had mild, borderline or moderate, severe or extreme depression	AbA1c	Beck Depression Inventory II (BDI-II)
Al Hayek <i>et al.</i> , 2013, KSA	101; 33 female (33%)	Mean age was 57.3	Baseline depression in the total population of patients with DM: 19.3%	Previous clinical diag- nosis	Arabic measure of the K6 depression and anxiety screening tool
Sulaiman <i>et al.</i> , 2010, UAE	347; 227 female (65.4%)	Mean age was 53.2	12.5% of patients obtained a score of 19 or above on the K6	previous diagnosis, chart review, FBS and AC1	Arabic measure of the K6 depression and anxiety screening tool
Sweileh <i>et al.</i> , 2014 Palestine	246; 164 female (67%)	Median age was 60	164 women, 77 (47%) had a BDI-II	self-reported diabetes type 2, clinic file, and HbA1c	Beck Depressions Inventory (BDI-II)
Al-Amer <i>et al.</i> , 2011, Jordan	649; 581, T2DM (89.5%) 367 female (56.5%)	Mean age was 57.3	20.1% of T2DM patients and 23.4% female diabetic obtained a score of 10 or above on the PHQ-8	previous diagnosis, chart review, and HbA1c	Patients' Health Questionnaire-8 (PHQ-8)
Bensbaa et al., 2014	N = 142 65.5% were women	Average age was $56.26 \pm 9$ years	93 women (T2DM) Prevalence of depression is 33.1 n = 31	Clinical records	The Moroccan-Arabic version of the Beck diagnostic scale of depression
ElMahalli, 2015, KSA	N = 269 Female 54.2%	Average age 53.19 ± 10.7	58.2% 82 women out of 141	Previous diagnosis, chart review, and HbA1c	The Center for Epidemiologic Studies Depression Scale (CES-S)
Gemeay, 2015, KSA	N = 100 (62.1% is the female percentage who have T2DM)	Average age was 58.6	66% (22)	Previous diagnosis, chart review, and HbA1c	Beck Depression Inventory (BDI) A 21-item screening questionnaire comprising 13 cognitive, and 8 somatic questions used to screen for depression

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Table 2. Summary of the included study: events and sample size.

#	Author, year, country	# Of event	Sample size
1	Bener et al., 2012, Qatar	76	431
2	Hawamdeh et al., 2013, UAE	45	70
3	Al Hayek et al., 2013, KSA	3	33
4	Sulaiman et al., 2010, UAE	28	227
5	Sweileh et al., 2014 Palestine	77	164
6	Al-Amer et al., 2011, Jordan	86	367
7	Bensbaa et al., 2014 (Moroco)	31	93
8	ElMahalli, 2015, KSA	82	141
9	Gemeay, 2015, KSA	29	44

**Figure 2** exhibits the pooled estimate of depression among T2DM clients in Arabic from nine studies. The outcome was the proportion of diabetic client who showed symptoms of depression based on Beck Depression Inventory II (BDI-II), Arabic measure on the K6 depression and anxiety; and patient's Health Questionnaire-8 (PHQ-8) and The Center for Epidemiologic Studies Depression Scale (CES-S). The effect size is the prevalence



Figure 1. Flow diagram for selection of studies.

Forest plot depicting the meta-analysis result of prevalence of depression among Arab women with type 2 diabetes									
Study	Statistics for each study				Event rate and 95% CI				Relative weight
	Event rate	Lower limit	Upper limit						
Bener et al., 2012	0.176	0.143	0.215			🗖			11.81
Hawamdeh et al., 2013	0.643	0.525	0.746						11.19
Al Hayek et al., 2013	0.091	0.030	0.247						8.31
Sulaiman et al., 2010	0.123	0.087	0.173			_   ■	4		11.47
Sweileh et al., 2014	0.470	0.394	0.546				, <b>T</b>		11.69
Al-Amer et al., 2011	0.234	0.194	0.280						11.82
Bensbaa et al., 2014	0.333	0.245	0.435				- In I		11.37
ElMahalli, 2015	0.582	0.499	0.660				- <b>-</b>		11.63
Gemeay, 2015	0.659	0.509	0.783				•		10.71
	0.341	0.219	0.490	-1.00	-0.50	0.00	0.50	1.00	

Figure 2. Pooled estimate of depression among T2DM Arab women.

of depression. The mean prevalence is 0.341 with a 95% confidence interval of 0.219 to 0.490, which means that about 34.1% of the Arabic T2DM clients have varying degree of depression.

### 4. Discussion

The prevalence rate of depression among Arab women with T2DM is significant at 34.1 % within 95% confidence level. This means that the Arab women with T2DM are not isolated from the prevalence of depression among individuals with DM throughout the world. Women comprise half of the population in the Arab countries. The fact that women are potential source of human force in the nation's economy, beside the huge domestic role in keeping their homes and families, merit more attention to direct attention on their health and well-being.

While these studies used different measures to assess risk for depression and anxiety, it is clear that there is evidence of high rates of both mental stress and T2DM in women in this region [28]. This finding is consistent with what the researchers have been seeing in several Arabic countries. While no longitudinal studies were iden-

tified in women in Arab countries measuring the relationship between diabetes and depression, the relationship has been established elsewhere. A meta-analysis, which looked globally at the relationship, identified 16 studies, which were longitudinal [29]. This article reported a positive association between diabetes and depression. Furthermore, this co-morbidity also results in a 1.5 fold increase in mortality from all causes.

Regional and intra-country data on diabetes should be increased. It is interesting to look at the EMRO region compared to the African region to the south. In Africa, rates of diabetes are much lower than EMRO and gender does not appear to be as predictive a factor for T2DM diagnosis. One meta-analysis looking at gender differences in Sub-Saharan Africa for prevalence of T2DM found that 5.7% of people overall are diabetic, with men having lower rates than women (5.5%; compared with 5.9%) [30]. Studies should be done to compare regional findings.

Women have higher risk of depression than men. One study from the US measured depression in over 2200 people, and found that the prevalence of major depression was 3.8% overall, with 4.4% of women and 3.3% depression in men [22]. In Arab countries, there has also been evidence of this trend [31]. The reasons for this difference are yet unknown.

One potential contributing factor to women in Arab countries having the comorbidity of depression and T2DM is Vitamin D deficiency. A relationship between Vitamin D deficiency and depression has been found [32]. This study found that there were lower serum Vitamin D levels in participants with psychological problems than those without (p < 0.05).

One of the reasons why there were limited studies on this subject, may be because of cultural issues, which makes screening for both T2DM and depression more difficult. It is likely that in Arab countries, both T2DM and depression are heavily under-reported.

## **5.** Conclusions

Significant rate of the prevalence of depression among Arab women with T2DM in the Arab countries cannot be discounted. Despite limited studies on Arab women in the Arab countries on depression and T2DM, findings of this review and analysis revealed a considerable phenomenon that is possibly increasing when properly assessed, documented, and given attention. Depression as a comorbidity of T2DM is as debilitating as T2DM itself, but being understudied, depression in T2DM is neglected and unattended among individuals with T2DM.

Depression has recently become a focus of global concern. Tackling depression requires great determination as there are many factors that would hinder its positive advancement such as the stereotype of shame that accompanies such a disorder. Furthermore there are often limited mental healthcare resources especially in low to moderate-income countries.

Women experiencing depression in such countries face a great amount of struggle as there is merely no access to any mental healthcare facilities or even specialists and even if available, their modest income would not allow such a visit. Likewise, these countries are only providing weak health systems that are incapable of handling chronic conditions such as T2DM and depression as not too long ago they were preoccupied in dealing with infectious diseases in their communities.

More studies need to be done in order to verify a causal relationship between depression and diabetes. Multisite studies should be done with consistent methodology. Long-term cohort studies should be done to lend evidence to causation (do T2DM Arab women develop depression or do depressed women develop T2DM).

In order for these studies to take place, screening needs to be done in a culturally sensitive way. Social marketing should be done to promote acceptance of people with dual diagnosis of T2DM and depression. Treatment options should be assessed, developed and offered to women throughout the Arab region.

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