

The association of depression and anxiety with unhealthy lifestyle among United Arab Emirates adults

Received 3 May 2011; Revised 22 September 2011; Accepted 25 September 2011

Key words: depression, anxiety, unhealthy lifestyle.

Dear Editor

The prevalence of mental health disorders in the United Arab Emirates (UAE) has increased over the past several decades (Abou-Saleh *et al.* 2001). According to local estimates, approximately between 55% and 73% of patients attending primary care in the UAE suffer mental disorders (El-Rufaie & Absood, 1993). The commonest diagnoses were depressive disorders 55%, mixed anxiety-depression 13% and anxiety disorders 12%. Worldwide research showed that depression and anxiety are major causes of morbidity and mortality (Harter *et al.* 2003; Chapman *et al.* 2005; Amaddeo & Tansella, 2010) and are associated with impaired health-related quality of life and social functioning, as well as with increased risk for disability (Kivimäki *et al.* 2009). Recent research indicates that people with major depression or anxiety disorders particularly panic disorder, have a higher prevalence of regular smoking than those without such conditions (McCabe *et al.* 2004). Obesity has been associated with increased life time risk for major depression and panic disorder or agoraphobia, particularly among females (Baumeister & Harter, 2007; Carpinello *et al.* 2009), and physical inactivity has been associated with depression (Allgower *et al.* 2001). In the meantime, exercise has been found to be an effective adjunct to the usual forms of treatment for depression, anxiety and has even a protective effect against suicide (Dunn *et al.* 2005; Muller *et al.* 2009). In this study, we examined the extent to which depression and anxiety were associated with smoking, physical inactivity and obesity among UAE adults using data from the population-based UAE health and life survey 2000 (UAEHALS 2000). To our knowledge, this is the

first large population-based study to examine these associations using the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983).

Methods

The targeted population of the survey is defined as citizen households (chhs) of UAE. The study sample was provided by the Central Department of Statistics, Ministry of Planning, Abu-Dhabi. It consisted of a random sample of 2000 households, representing UAE local population, irrespective of the age of the individuals in each household. The sampling frame was based on the list of households obtained in the 1995 population census. To avoid duplicate probabilities of selection, all selected households from the Fund registry were contacted, and those who were found to be living with parents were dropped from the sample. Both the compilation of the sample frame and the drawing of the master sample were supervised by two sampling experts from the United Nations Statistical Office. The master sample was designed as a two-stage, stratified cluster sample of approximately 4000 chhs in 210 primary sampling units (PSUs). The PSUs consist of census enumeration areas in urban sectors and villages in rural sectors. The 2000 households used in this survey were selected by randomly choosing approximately half the households within each PSU of the master sample. From each sampled household, a Kish grid was used to randomly select: one infant aged between 0 and less than 24 months, one child aged between 2 and less than 12 years old, one child aged between 12 and 15 years old, one adult male aged between 16 and 59 years old, one adult female aged between 16 and 59 years old and one elderly aged 60 years or above. The PSUs were stratified into six size categories, according to the number of chhs per PSU. These strata were: urban PSUs with 5–19 chhs, urban PSUs with 20–49 chhs, urban PSUs

* Address for correspondence: Professor H. Moselhy, Department of Psychiatry, Faculty of Medicine and Health Sciences, UAE University, P.O. Box 17666, Al Ain, UAE.
(E-mail: hamdy.fouad@uaeu.ac.ae)

with 50+ chhs, rural PSUs with 10–49 chhs, rural PSUs with 50–199 chhs and rural PSUs with 200+ chhs. Urban PSUs containing less than 5 chhs and rural PSUs with less than 10 chhs were excluded. A total of 1617 urban PSUs and 98 rural PSUs were excluded in this process. The excluded PSUs IRd were a total of 1867 urban chhs (3.7%) and 165 rural chhs (0.6%). The sample design gave equal probability of selection to each household. This was achieved by selecting PSUs at varying rates according to stratum and households at a different rate such that the overall probability of selection of households is equal to 1/20 across all strata.

Measures

After reviewing surveys from other parts of the world and conducting a literature review a pre-designed survey questionnaire was developed to extract data. The questionnaire was translated into Arabic and was field-tested and appropriate modifications were made. The questions on health risk behaviours covered smoking, physical activity and food consumption pattern. The physical activity questions were influenced by the emphasis in recent years on the health benefits of regular moderate physical activity, rather than on vigorous exercise. This was measured by the question 'How many days in the last seven days did you do any sports or other physical activities?' Other health-risk factors including measurement of body mass index (BMI) and blood pressure were also included in the survey. We used the Hospital Anxiety and Depressions Scale (HADS) 12 to measure the mental health of the participants. This was chosen because the instrument has already been translated into Arabic and its validity established (El-Rufaie & Absood, 1995).

Procedure

The survey was conducted in phases. First phase involved interviews in Al-Ain city followed by Abu-Dhabi city. Before the interviews an advance team visited the selected households and identified the houses. A leaflet explaining the survey was also distributed to the selected households. In each household an adult male, female, elderly, child and an infant were interviewed when available. If there were more than one child in a household then a child was selected at random. Similarly for other age groups a simple random technique was employed. In the survey, we used Kish grid that has been employed in previous community surveys (World Health Organization, 1995), which enabled us to verify that the respondents were chosen at random. The questionnaire was administered face-to-face for adults and elderly. For infants and

young children a family member answered on behalf of the respondent.

Statistical analysis

Mixed effects of logistic regression models were used to assess the association between each of the three responses 'Anxiety', 'Depression' and 'Anxiety-Depression' *v.* 'Smoking', 'Physical Activity' and 'BMI', whereas controlling for the effects of variables 'age' and 'sex'. The mixed effects of logistic regression models were used to account for potential correlations among the responses of subjects from the same family, since the study sample is hierarchical in nature and consists of clusters of one to three subjects from the same family. Both unstructured and independent correlation matrices were fitted and the one that provided better fit for the data was selected. Better fit for the data was determined by a smaller Quasi-likelihood for Independence Criteria (QIC). The data analysis was performed using the generalized estimating equations procedure in SPSS 17.

In all the performed analyses, the independent correlation structure provided a better fit than the unstructured structure. Moreover, in all the analyses, we tested the significance of interaction between 'sex' and 'age' and 'sex' and 'BMI'. We only report the most significant models. Given that the subjects' responses appear to be independent, we also used Pearson's chi-square test and confidence intervals for proportions to compare the distribution of mental disorders across demographic variables and risk factors. Also, given that a two-tailed *p*-value <0.05 indicated statistical significance. Ethical approval was obtained from the Faculty of Medicine and Health Sciences, United Arab Emirates University, Local Ethics Committee.

Study sample description

A total of 617 households were visited during the survey. Of these 441 households were from Abu-Dhabi city and 176 were from Al-Ain city. The survey had a sample size of 2089 citizens. There were 238 infants, 512 children, aged 2–15 years, 623 adults females, 601 adult males and 115 subjects aged 65 years and above. Anxiety and depression were measured only in adults. A total of 1224 were assessed.

Results

Mental disorders and socio-demographic characteristics

Approximately 13.9% of persons had current depression as assessed by the HADS and 18.7% had current diagnosis of anxiety.

Table 1 shows the prevalence of anxiety, depression and mixed anxiety-depression by selected socio-demographic variables.

The odds of depression increase with age, but at different rates for males and females. For a one-year increase in age, the odds of depression increase by 6% for males and 4% for females (see Table 3).

Prevalence of mental disorder status and health-related risk factors

Table 2 shows the prevalence of current depression, anxiety and mixed anxiety-depression and health-related risk factors.

Physical activity

For the purpose of analysis, physical activities were classified into two categories. Firstly, physically inactive which include: (a) sedentary where no sports/activities in the previous 7 days or (b) relatively inactive where the subject will take part in some leisure-time physical activity in the previous 7 days, but less than 2.5 hours in total. Secondly, physically active which include: (a) relatively active where the subject will take part at least 2.5 hours, but less than 5 hours of leisure time physical activity in the previous

7 days or (b) highly active where the subject will take part in 5 hours of leisure-time physical activity in the previous 7 days. Significantly more females were inactive than males ($p=0.001$). Proportion of sedentary subjects increased with age ($p=0.001$). There was a negative association with education and increasing family income. Subjects who reported to be highly active were higher in urban (22.7%) compared with rural areas (18.4%). Proportion of subjects who reported to be highly active decreased with decreasing self-reported health status ($p=0.001$).

Smoking

Those who ever smoked in their lifetime represent 278, 21.2% of the whole sample, 109, 8.2% of them have quit smoking. The current smokers account for 169, 12.8%. There was a very low self-reported percentage of current smokers among women (5, 0.7%, 95% CI = 0.1–1.3) or past smokers (4, 0.6%, 95% CI = 0.2–1.5). About a quarter of the males were currently smoking (164, 25.2%, 95% CI = 21.9–28.5) and 105, 16.1% 95% CI = 13.3–18.9 were past smokers. Half the males, 30–59 years old, reported having smoked sometimes in their lifetime. The proportion of male current smokers was significantly higher ($p=0.001$) among middle

Table 1. Prevalence of current depression, anxiety and mixed anxiety-depression among UAE adults by selected characteristics

	Anxiety		Depression		Anxiety-depression	
	Total	<i>n</i> (%) 95% CI	Total	<i>n</i> (%) 95% CI	Total	<i>n</i> (%) 95% CI
Sex						
Male	606	74 (12.2) 9.6–14.8	611	59 (9.7) 7.4–12.0	631	23 (3.6) 2.1–5.1
Female	640	159 (24.8) 21.5–28.1 $p=0.001$	638	114 (17.9) 14.9–20.9 $p=0.001$	655	64 (9.8) 7.5–12.1 $p=0.001$
Age						
16–29	549	127 (23.1) 19.6–26.6	552	54 (9.8) 7.3–12.3	566	35 (6.2) 4.2–8.2
30–44	363	53 (14.6) 11.0–18.2	370	29 (7.8) 5.1–10.5	379	14 (3.7) 1.8–5.6
45–59	167	26 (15.6) 10.1–21.1	165	28 (17.0) 11.2–22.7	171	16 (9.4) 5.0–13.8
60–74	115	18 (15.7) 9.1–22.3	109	40 (36.7) 27.7–45.7	115	16 (13.9) 7.6–20.2
75 +	37	7 (18.9) 6.3–31.5 $p=0.012$	36	20 (55.6) 39.4–71.8 $p=0.001$	37	6 (16.2) 4.3–28.1 $p=0.001$
Education						
Read only	309	56 (18.1) 13.8–22.4	299	89 (29.8) 24.35.0	315	39 (12.4) 8.7–16.0
Elementary	393	78 (19.8) 15.9–23.2	404	37 (9.2) 6.4–12.0	410	23 (5.6) 3.4–6.4
Secondary	305	57 (18.7) 14.3–23.1	302	28 (9.3) 6.0–12.6	313	13 (4.2) 2.0–6.4
University	232	41 (17.7) 12.8–22.6 $p=0.904$	237	19 (8.0) 4.5–11.5 $p=0.001$	241	12 (5.0) 2.2–7.8 $p=0.155$
Area						
Urban	623	128 (20.5) 17.3–23.7	622	81 (13.0) 10.4–15.6	643	43 (6.7) 4.8–8.6
Rural	623	105 (16.9) 14.0–19.8 $p=0.095$	627	92 (14.7) 11.9–17.5 $p=0.398$	643	44 (6.8) 4.9–8.7 $p=0.912$

Table 2. Prevalence health-related risk factors among UAE adults by mental disorder status

	Anxiety		Depression		Anxiety-depression	
	Total	<i>n</i> (%) 95% CI	Total	<i>n</i> (%) 95% CI	Total	<i>n</i> (%) 95% CI
Physical activity						
Sedentary	616	128 (20.8) 17.6–24.0	613	115 (18.8) 15.7–21.9	632	58 (9.2) 6.9–11.5
Relatively inactive	213	35 (16.4) 11.4–21.4	214	27 (12.6) 8.2–17.0	220	12 (5.5) 2.5–8.5
Relatively active	166	24 (14.5) 9.1–19.9	167	12 (7.2) 3.3–11.1	171	5 (2.9) 0.4–5.4
Highly active	251	46 (18.3) 13.5–23.1	255	19 (7.5) 4.3–10.7	263	12 (4.6) 2.1–7.1
		<i>p</i> = 0.216		<i>p</i> = 0.000		<i>p</i> = 0.006
Smoking						
Never smoked	978	185 (18.9) 16.5–21.4	981	142 (14.5) 12.3–16.7	1010	70 (6.9) 6.9–8.5
Current smoker	155	27 (17.4) 11.4–23.4	154	14 (9.1) 4.6–13.6	159	9 (5.7) 2.1–9.3
Ex-smoker	102	16 (15.7) 8.6–22.7	102	14 (13.7) 7.0–20.4	105	6 (5.7) 5.3–8.0
		<i>p</i> = 0.681		<i>p</i> = 0.196		<i>p</i> = 0.769
Obesity (BMI)						
Underweight	139	27 (19.4) 12.8–2.6	139	19 (13.7) 8.0–19.4	143	12 (8.4) 3.8–12.9
Healthy weight	383	60 (15.7) 12.0–19.3	383	40 (10.4) 7.4–13.5	394	16 (4.1) 2.1–6.0
Overweight	388	80 (20.6) 16.6–24.6	391	57 (14.6) 11.1–18.1	402	29 (7.2) 4.7–9.7
Moderately obese	197	34 (17.3) 12.0–22.5	199	28 (14.1) 9.2–18.9	203	14 (6.9) 3.4–10.4
Severely obese	95	22 (23.2) 14.7–31.6	93	12 (12.9) 6.1–19.7	97	9 (9.3) 3.5–15.1
		<i>p</i> = 0.305		<i>p</i> = 0.503		<i>p</i> = 0.796

aged (35.6%) and younger people (24.7%) than among the elderly, 60 years old or above (about 10%).

Obesity

BMI was calculated using the standard formula for adults and the subjects were classified according to the World Health Organization classification as follows: less than 20 as underweight; 20–24.9 as healthy weight range; 25–29.9 overweight; 30–34.9 moderately obese; and 35–39.9 severely obese. Although males outnumbered female in overweight group of population, 230, 36.7%, 95% CI = 32.9–40.5 *v.* 187, 28.4%, 95% CI = 25.0–31.8 female outnumbered males in both moderately obese and severely obese groups and *p*-value was significant *p* = 0.001, 131 females, 19.9%, 95% CI = 16.9–22.9 *v.* 85 males, 13.6%, 95% CI = 10.9–16.3 in moderately obese group; 76 females, 11.5%, 95% CI = 9.1–13.9 *v.* 22 males, 3.5%, 95% CI = 2.1–4.9 in severely obese group.

Relationship between mental disorder and unhealthy behaviours

After controlling for age and sex, there was a negative association between depression and physical activity. We found that adults who had depression were more likely to lead sedentary life than having highly active or relatively active life. Additionally, adults who had

anxiety disorder were significantly more likely to be currently smokers or ex-smokers than being never smoked. The odds of anxiety among the past and current smokers are double the odds of those who never smoked. See Table 3 for multiple mixed logistic regressions of mental disorders and unhealthy behaviours after controlling for age and sex.

Discussion

Our population-based study from a randomly representative sample of the UAE population, suggest that life style, depression and anxiety may be an important public health construct. Our study reveals several interesting findings in this regard. Firstly, people with anxiety were significantly either smoker or ex-smoker, which is consistent with the results of recent research which showed similar results (Cassidy *et al.* 2006).

Secondly, people with depression or anxiety are more likely than those without these diagnoses to be obese or overweight. However, this was not significant after controlling for age and sex. This is inconsistent with the results of recent publications (Petry *et al.* 2008; Kivimaki *et al.* 2009). Although, epidemiologic data suggest an association between obesity and both depression and anxiety, findings vary across studies (Simon *et al.* 2006). Meanwhile, the association between obesity and anxiety seems to be strongest

Table 3. Mixed logistic regressions of mental disorder status and health-related risk factors (controlling for age and sex), with independent correlation structure

	Anxiety		Depression		Anxiety-depression	
	<i>p</i> -value	OR (95% CI)	<i>p</i> -value	OR (95% CI)	<i>p</i> -value	OR (95% CI)
Sex	0.000		0.000		0.000	
Female		Referent		Referent		Referent
Male		0.426 (0.315–0.575)		0.125 (0.042–0.376)		0.325 (0.193–0.548)
Age	0.082	0.991 (0.981–1.001)	0.000	1.037 (1.024–1.050)	0.000	1.024 (1.011–1.037)
Sex × Age	–		0.024		–	
Female × Age		–		Referent		–
Male × Age		–		1.025 (1.003–1.047)		–
Physical activity	0.267		0.020		0.163	
Sedentary		1.094 (0.730–1.639)		1.690 (0.992–2.882)		1.445 (0.748–2.792)
Relatively inactive		0.776 (0.477–1.264)		1.568 (0.817–3.006)		1.043 (0.456–2.385)
Relatively active		0.769 (0.449–1.319)		0.673 (0.316–1.431)		0.542 (0.189–1.554)
Highly active		Referent		Referent		Referent
Smoking	0.038		0.534		0.196	
Never smoked		0.517 (0.273–0.978)		1.070 (0.535–2.141)		0.608 (0.220–1.679)
Current smoker		0.934 (0.462–1.888)		1.526 (0.674–3.456)		1.407 (0.512–3.866)
Past smoker		Referent		Referent		Referent
Obesity (BMI)	0.296	1.013 (0.989–1.038)	0.921	0.999 (0.969–1.029)	0.732	1.007 (0.968–1.047)

for those with severe obesity, which is consistent with other studies (Dong *et al.* 2004).

Inadequate levels of physical activity is a particular problem for people with current depression, among whom we found the prevalence of sedentary and physical inactivity to be twice as high as among people who were depressed but active. This is consistent with the results of some research suggesting that physical inactivity may be a risk factor for depressive symptoms (Gullette & Blumenthal, 1996).

Our study has several limitations. Firstly, in this investigation, health status was determined from self-report question and therefore, may not effectively convey the entire components comprising this construct. Secondly, the sample population was limited to data from two cities; therefore, our results may not be representative of the entire country. Finally, we cannot infer a causal relationship between the low level of physical activity, obesity and smoking with both depressive and anxiety disorders, although our results support our conclusion that these characteristics are associated.

Notwithstanding these limitations, our results corroborate the previous research suggesting that the lifestyle is strongly associated with poor mental health, particularly depression and anxiety (Petry *et al.* 2008). As the lifestyle encompasses multiple personal dimensions, it may be an important characteristic for community health studies. Future research should investigate in-depth the relationship between physical and mental symptoms and the level of lifestyle as a predictor of psychiatric disorders.

In conclusion, there are strong influences of psychiatric disorders, mainly depression and anxiety as negative factors of the level of lifestyle in adults. The findings underscore the need to develop interventions that help people deal more effectively with both physical and mental health.

Declaration of Interest

Sponsor of this research is the Office of the Research Affairs, UAE University, United Arab Emirates (Grant No. 01-8-12/00).

Authors have no conflict of interest related to the present paper

H. F. Moselhy^{1*}, R. Ghubach¹, O. El-Rufaie¹, T. Zubeidi², P. Badrinath³, S. Sabri¹ and S. Yousef¹

¹Department of Psychiatry and Behavior Sciences, Faculty of Medicine, UAE University, Al Ain, UAE

²Department of Statistics, Faculty of Business and Economics, UAE University, Al Ain, UAE

³Department of Community Medicine, UAE University, Al Ain, UAE

References

- Abou-Saleh MT, Ghubash R, Dardkeh TK (2001). Al Ain community psychiatric survey 1. Prevalence and sociodemographic correlates. *Social Psychiatry and Psychiatric Epidemiology* **36**, 20–28.
- Allgower A, Wardle J, Steptoe A (2001). Depressive symptoms, social support, and personal health behaviors in young men and women. *Health Psychology* **20**, 223–227.
- Amadeo F, Tansella M (2010). Mortality among people with mental disorders. *Epidemiologia e Psichiatria Sociale* **19**, 1–3.
- Baumeister H, Harter M (2007). Mental disorders in patients with obesity in comparison with healthy probands. *International Journal of Obesity* **31**, 1155–1164.
- Carpiniello B, Pinna F, Pillai G, Nonnoi V, Corrias S, Orru MG, Orru W, Velluzzi F, Loviselli A (2009). Obesity and psychopathology. A study of psychiatric comorbidity among patients attending a specialist obesity unit. *Epidemiologia e Psichiatria Sociale* **18**, 119–127.
- Cassidy K, Kotynia-English R, Acres J, Flicker L, Lautenschlager NT, Almeida OP (2006). Association between lifestyle factors and mental health measures among community-dwelling older women. *Australian and New Zealand Journal of Psychiatry* **38**, 940–947.
- Chapman DP, Perry GS, Strine TW (2005). The vital link between chronic disease and depressive disorders. *Preventing Chronic Disease* (http://www.cdc.gov/pcd/issues/2005/jan/pdf/04_0066.pdf). Accessed 11 December 2007.
- Dong C, Sanchez LE, Price RA (2004). Relationship of obesity to depression: a family-based study. *International Journal of Obesity and Related Metabolic Disorders* **28**, 790–795.
- Dunn AL, Trivedi MH, Kampert JB, Clark CG, Chambliss HO (2005). Exercise treatment for depression: efficacy and dose response. *American Journal of Preventive Medicine* **28**, 1–8.
- El-Rufaie OEFA, Absood G (1993). Minor psychiatric morbidity in primary health care: prevalence, nature, and severity. *International Journal of Psychiatry* **39**, 159–166.
- El-Rufaie OE, Absood GH (1995). Retesting the validity of the Arabic version of the Hospital Anxiety and Depression (HAD) scale in primary health care. *Social Psychiatry and Psychiatric Epidemiology* **30**, 26–31.
- Gullette ECD, Blumenthal JA (1996). Exercise therapy for the prevention and treatment of depression. *Journal of Practice Psychiatry and Behavioural Health* **5**, 263–271.
- Harter MC, Conway KP, Merikangas KR (2003). Associations between anxiety disorders and physical illness. *European Archives of Psychiatry and Clinical Neuroscience* **253**, 313–320.
- Kivimaki M, Batty GD, Singh-Manoux A, Nabi H, Sabia S, Tabak AG, Akbaraly T, Vahtera J, Marmot MG, Jokela M (2009). Association between common mental disorder and obesity over adult life course. *British Journal of Psychiatry* **195**, 149–155.
- McCabe RE, Chudzik SM, Antony MM, Young L, Swinson RP, Zolvensky MJ (2004). Smoking behaviors across anxiety disorders. *Journal of Anxiety Disorders* **18**, 7–18.
- Muller B, Georgi K, Schnabel A, Schneider B (2009). Does sport have a protective effect against suicide? *Epidemiologia e Psichiatria Sociale* **18**, 331–335.

- Petry NM, Barry D, Pietrzak RH, Wagner JA** (2008). Overweight and obesity are associated with psychiatric disorders: results from the National Epidemiologic Survey on alcohol and related conditions. *Psychosomatic Medicine* **70**, 288–297.
- Simon GE, Von Korff M, Saunders K, Miglioretti DL, Crane PK, Van Belle G, Kessler R** (2006). Association between obesity and psychiatric disorders in US adult population. *Archives of General Psychiatry* **63**, 824–830.
- World Health Organization** (1995). Physical status: the use and interpretation of anthropometry. Report of WHO Expert Committee WHO.
- Zigmond AS, Snaith RP** (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica* **67**, 361–370.