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RELATIONSHIP BETWEEN FOOD INSECURITY AND DEPRESSION IN ELEMENTARY SCHOOL STUDENTS' MOTHERS

The study aims to find the relationship between household food insecurity and depression among mothers of elementary school students in Bandar-E-Anzali; North of Iran. In this cross-sectional analysis, there have been randomly recruited 400 mothers with mean \pm SD age of 37.28 ± 5.68 years by random selection of female students from 12 public elementary schools. The subjects answered questions from socioeconomic factors, Family Food Security (USDA), and Beck Depression questionnaires. The data have been analyzed by means of Chi Square and multiple logistic regression analysis methods. According to the results, 33% of mothers were vulnerable to depression, and 18.5 % had different levels of depression (12.8% moderate depression, 5.2% severe depression, and 0.5% higher severe depression). Furthermore, 51% were in food insecurity condition (26% food insecurity without hunger, 16.5% food insecurity with moderate hunger, and 8.5% food insecurity with severe hunger). There was a significant relationship between food insecurity and depression ($p < 0.0001$), and 29.4% of mothers with food security had depression as compared to 7.1 % mothers who were depressed but had no manifestations of food insecurity. The highest rate of depression was in single mothers who had food insecurity, and the highest rate of food insecurity was observed in the families who did not reside in their own houses, unemployed mothers or fathers, with no University education. Logistic regression model including confounders, demonstrated that no house ownership ($p = 0.01$), having a sick member at home ($p = 0.02$), and being a single mother ($p = 0.03$) were the most significant factors on mothers' depression. Therefore, food insecurity can cause depression.

Keywords: food insecurity, depression, socioeconomic status, women, nutrition, diet.

Abbreviations

World Health Organization (WHO), United States Department of Agriculture (USDA), Number (N), Odds Ratio (OR)

Introduction

Depression is one of the most common mental diseases [1], characterized by decreased energy and motivation and interest, feeling of guilt, lack of concentration, loss of appetite, death and suicide thoughts, modification of activity levels, cognitive skills, speech, sleeping, eating, and other biologic rhythms. The mentioned symptoms may impact working, social, and interpersonal activities [2]. According to a report by World Health Organization (WHO), depression is the second most prevalent disease after cardiovascular diseases [3]. Furthermore, it is estimated that 20-25% of people have experienced some episodes of depression during their lifetime [4]. Women are reported two times more susceptible to depression as compared to men [5]. In other words, the lifetime risk of depression is 10-25% for women and 5-12% for men [6].

Food insecurity is defined as limited or insecure accessibility to healthy and sufficient food in terms of nutri-

tional value or social desirability [7]. Food insecurity can affect mental health either by disappointment due to disability to afford buying sufficient and nutritive food or the effect of malnutrition on physical and mental health and immune system integrity [8]. In the American elderly population, obesity due to food insecurity is one of the causes of elderly depression [16, 17]. Other studies have related lower education and mother's marital status to food insecurity and depression [18]. More than 60% of developing countries population and 50% of families involved in food insecurity live in Asia, and it is estimated that during 2007 to 2017, about 20% of this population will have malnutrition [9]. In the United States of America, the prevalence of food insecurity was 11.9% and 14.7% in 1995 and 2009 respectively [9, 10]. The prevalence of food insecurity in Iran has been reported as 36.6% in Asad Abad; Tabriz province [11], 30.5% in Yazd among families of elementary school children [12], 44% among families in Shiraz [13], and 50.5% in Shahr-E-Rey; Tehran province [14].

This study **aims to** investigate the relationship between food insecurity and depression in mothers of ele-

mentary school students in Bandar-E-Anzali, north of Iran.

Furthermore, we studied other minor independent variables including education and employment status of mothers and fathers, house ownership, socioeconomic status, and the fact of having a sick member at home in relation with depression and food security. According to our knowledge, this study has been conducted for the first time in Iran.

Materials and Methods

The current study is a cross sectional analysis on 400 families of female students from 12 public elementary schools in 3rd, 4th, and 5th levels living in Bandar-E-Anzali, conducted in 2014. We recruited our subjects from elementary school mothers in Bandar-E-Anzali where the number of schools was limited and random sampling was easier. Recruiting procedure started after taking permission letter from the related authorities such as Province Education Office and school managers to organize group meetings and ask those mothers who were selected randomly to participate the meeting and take part in the project. The invitation letters were delivered to the mothers and they were asked to participate in the group meeting, where we explained the project details, and asked mothers to sign the consent if they were interested to be a part of study population. Afterward, the mothers were asked to fill the USDA Family Food Security questionnaire containing 18 questions. The mentioned questionnaire has been evaluated in 2009 by Rafei and coworkers in Isfahan Province and represented validity and reliability [13].

According to the aforementioned questionnaire, families with scores 0-2 were categorized as secure, 3-7 – as insecure without hunger, 8-12 – as insecure and medium hunger, and ≥ 13 – as insecure with severe hunger. Evaluation of depression in mothers was conducted using Beck Depression Questionnaire with 21 questions. Several studies have evaluated Beck questionnaire in terms of reliability and validity and the results of these studies have represented that Beck questionnaire is valid and reliable and is not affected by a particular culture, and is effective in several socioeconomic groups of people [14]. Cronbach's Alpha coefficient for Beck questionnaire evaluation was 0.91, and validity coefficient was 0.94. Correlation of Beck Questionnaire with Hamilton Depression Scale was 0.73, and 0.76 with Zung Depression Scale, and 0.76 with MMPI Depression Scale [4]. Alpha coefficient for internal correlation of Iranian Beck questionnaire was 0.78, and reliability coefficient was 0.86 [5].

In Beck questionnaire, 0 score is allocated to the first choice of each question, 1 to the second choice, 2 to the third choice, and 3 to the fourth. The subjects must only select one answer from each question which is absolutely representative of their feeling at the moment or less than recent month (only about some questions). The highest score for this questionnaire is 63. We categorized mothers who got 1-10 points as those who have normal level of depression, 11-16 – in minimal depression, 17-20 – required consulting a psychotherapist, and put all these three groups in one major group called “**Normal**”. Those who took 21-30 were categorized as moderately depressed, 31-40 – severe depression, and >40 – higher severe depression, and were grouped as “**Depressed**”. In other words, the final analysis was done on two main groups named Normal and Depressed.

Data analysis was carried out by statistical software package IBM SPSS version 16. Chi Square test was done to find the relationship between food insecurity and mothers' depression as well as other variables with either depression or food insecurity. Eventually, those variables which had significant association with food insecurity and mothers' depression were input in multiple logistic regression model, and final independent variables were determined by stepwise elimination of confounders via Backward Elimination method.

Results and Discussion

Study population consisted of 400 mothers of elementary school female students in the 3rd to 5th levels with the mean age of 37.28 ± 5.68 years. According to the results of this study, 33% of mothers were vulnerable (23.5% minimal depression, and 9.5% requiring counseling with a psychotherapist), 18.5% had different levels of depression (12.8% moderate depression, 5.2% severe depression, and 0.5% higher severe depression). Furthermore, 51% of mothers were in food insecurity circumstance (26% food insecurity without hunger, 16.5% food insecurity with moderate hunger, and 8.5% food insecurity with severe hunger).

According to table 1, the number of depressed mothers was significantly higher among those with food insecurity. The level of depression in single mothers was higher than those living with their husbands ($p=0.018$). Father's unemployment or education represented significantly higher depression in mothers ($p=0.004$, $p=0.018$ respectively). Besides, depression in mothers was in direct significant correlation with having an ill family member at home ($p=0.009$).

Table 1.

Distribution of Qualitative Independent Variables Based on Depression Status in Mothers Among Elementary Students' Households

Qualitative variables		Normal		Depressed		Total number	P-value
		%	N	%	N		
Food Security status	insecure	70.6	144	29.4	60	204	0.0001
	Secure	92.9	182	7.1	14	196	
Father's job	Unemployed	55.6	10	44.4	8	18	0.004
	employed	82.7	316	17.3	66	382	
Fathers education	No University	79.0	245	21.0	65	310	0.018
	University	90	81	10.0	9	90	
Mother's marital status	single	61.9	13	38.1	8	21	0.018
	Have husband	82.6	313	17.4	66	379	
Sick member at home	no	83.4	292	16.6	58	350	0.009
	yes	68.0	34	32.0	16	50	

N: Number

Food insecurity was significantly higher in the families where mothers were house wives or fathers did not have job (p=0.0001, 0.004 respectively) as compared to those with employed mothers or fathers. Furthermore, 55% of mothers without University education had depression as compared to 14% of mothers with University education (p<0.0001). Fathers' education was also significantly effective on mothers' depression so that 60% of mothers whose husbands did not have University educa-

tion were depressed in comparison with 17.8% of the families with educated fathers (p<0.0001). Furthermore, food insecurity was in direct significant relationship with house ownership (p<0.0001), having an ill family member at home (p=0.02), and lower socioeconomic level (p<0.0001). However, there was no significant relationship with mother's marital status and household dimension (table 2).

Table 2.

Distribution of Independent Qualitative Variables Based on Food Security Among Elementary Students' Households

Qualitative variables		Secure		insecure		Total number	P-Value
		%	N	%	N		
Mother's job	House wife	44.8	158	55.2	195	353	0.0001
	Employed	80.9	38	19.1	9	47	
Father's job	Unemployed	22.2	4	77.8	14	18	0.020
	Employed	50.3	192	49.7	190	382	
Mother's education	No University	44.5	159	55.5	198	357	<0.0001
	University	86.0	37	14.0	6	43	
Father's education	No University	39.4	122	60.6	188	310	<0.0001
	University	82.2	74	17.8	16	90	
House ownership	No ownership	36.7	66	63.3	114	180	<0.0001
	ownership	59.1	130	40.9	90	220	
Have sick member at home	No	51.1	179	48.9	171	350	0.02
	yes	34.0	17	66.0	33	50	
Socioeconomic status	Low	33.8	73	66.2	143	216	<0.0001
	Medium	63.7	100	36.3	57	157	
	high	85.2	23	14.8	4	27	

After running the multiple logistic regression model including confounders, the results demonstrated that Odds Ratio (OR) of depression was 5.31 among food insecure group (p<0.0001), 3.04 among those having no house

ownership (p=0.01), 2.21 in those who had a sick family member at home (p=0.02), and 2.89 among single mothers (p=0.03). The results can be seen in table 3.

Table 3.

Independent Factors Affecting Depression

Independent variable	OR (confidence interval 0.95)	P-value
Food insecurity	5.31 (2.82-9.99)	<0.0001
No house ownership	3.04 (1.19-7.72)	0.01
Have sick member at home	2.21 (1.10-4.44)	0.02
Single mother	2.89 (1.07-7.78)	0.03

Logistic Regression Model (Backward elimination), OR: Odds Ratio

Discussion

Our study aimed to investigate the relationship between food insecurity and depression in mothers of elementary school children in Bandar-E-Anzali, Iran. The results represented that food insecurity is in direct association with depression, and other factors including university education, house ownership, employment, socio-economic status, and having a sick member in the family can significantly affect depression in mothers. In the current study, prevalence of depression was 18.0% among mothers, and the highest prevalence was among those families who were involved in food insecurity in a way that 29.4% of mothers in families with food insecurity, and 7.1% of mothers in food security had depression. In Columbia, Casey and coworkers, studied mothers who had < 3-year-old kids, and found significant positive relationship between food insecurity and depression so that 32.9% of mothers in food secure families and 67.1% of food insecure families were depressed [18]. Whitaker and colleagues found that prevalence of depression in mothers with kids < 3-year-old in families with food insecurity was 28.5% and in families with food security was 20.2% [16]. Hadley and coworkers conducted an investigation in Tanzania rural area in 2008, and represented that the rate of depression and stress is higher among those with food insecurity [19]. Kollannoor and coworkers conducted a study in 2011 showing social support may compensate for the effect of food insecurity on depression [20]. Therefore, the results of current study are along with other studies with a similar topic.

Less affordability of the household not only affects the ability to purchase healthy foods, but may also lead to higher intake of energy dense foods with lower micronutrients such as vitamin D and Vitamin B group. Vitamin B deficiency may decrease serotonin level in brain and incidence of depression symptoms [21].

A study by Hogberg and coworkers demonstrated that decreased levels of serum vitamin D had significant positive effect on depression [22]. Such studies can show the direct effect of nutrition on mental health. Furthermore, the main responsibility of cooking food and serving is a mothers' duty, and this can be another factor putting extra mental pressure on her. According to Matud and colleagues, women feel more stressed in critical situations as compared to men, and show avoiding and emotional reactions [23] which can lead to depression in long time. Other investigations represented that depressed people

prefer avoiding reaction rather than problem solution attitude [24, 25].

In the current study, depression in mothers and father's job had significant association so that mothers whose husbands were unemployed had higher level of depression. In a study by Ahmadi and Yusefi, depression prevalence in housewives and unemployed women was higher than it was in employed ones [26]. Occupation and social communication among households may prevent symptoms of depression because of financial welfare and being involved in some tasks rather than encountering negative and disappointing thoughts. Findings of this study represented that women's depression had significant relationship with their husbands' education level. In studies done on residents of Ontario in Canada and Malatia; Turkey women's depression was in significant association with their education level [27, 28]. Higher education may increase knowledge and improve right attitude to find better social position and flexibility in challenges, and may help people to find a better way rather than surrender and isolation which all together could prevent depression.

In this study, single mothers were more depressed as compared to those who were living with their husbands. Cairney and colleagues represented in their study that depression is two times more prevalent in single mothers comparing with those who live with their husbands [29]. Another study in London found significant association between depression and marital status in mothers [30]. The reason is probably because of financial responsibility and lack of emotional support from their husbands.

Our study demonstrated significant relationship between the fact of having an ill member in the family and depression. Looking after an unhealthy member increases mothers' responsibility more than other members of family in terms of health care costs and other responsibilities.

Conclusion

Findings from this study showed that food insecurity, absence of house ownership, having an ill member in family, and living without a husband are among risk factors of depression in mothers. Furthermore, higher prevalence of depression among families encountering food insecurity, and the indirect effect of food insecurity causes on incident depression, it seems necessary to attenuate food insecurity challenge among families. This study has been conducted for the first time in Iran, and further studies are required to find accurate causes and effects. Since this study was cross-sectional, further case-control and cohort studies are recommended.

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Conflict of Interest

The authors of this article did not have any conflict of interest.

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ВЗАЄМОЗВ'ЯЗОК МІЖ НЕСТАЧЕЮ ПРОДУКТІВ І ДЕПРЕСІЄЮ У МОЛОДИХ ЖІНОК

Мета статті полягає у визначенні взаємозв'язку між нестачею продуктів та депресією серед матерів учениць початкової школи в Бандар-Е-Анзалі, північ Ірану. В емпіричному дослідженні було обрано випадковим чином 400 матерів із середнім віком $37,28 \pm 5,68$ років учениць із 12 загальноосвітніх початкових шкіл. Серед методів дослідження було використано розроблену анкету щодо соціально-економічних факторів сім'ї, Опитувальник продовольчої безпеки родини та Шкалу депресії Бека. Дані були проаналізовані за допомогою критерію хі-квадрат та методами логістичного регресійного аналізу. Згідно з результатами, 33% матерів були вразливі до депресії, у 18,5% - виявлено різні рівні депресії (12,8% - середній ступінь депресії, 5% - глибока депресія та 0,5% - надглибока депресія). Крім того, 51% респондентів страждали тією чи іншою мірою від нестачі харчових продуктів (26% мали нестачу продуктів без ознак голодування, 16,5% - продовольча нестача з помірним голодом та 8,5% - відсутність провіанту із сильним голодом). Виявлено значний зв'язок між нестачею продуктів у сім'ї та депресією ($p < 0,0001$). Найвищий рівень депресії спостерігався в одиноких матерів з нестачею продуктів. Найвищий рівень нестачі продовольства спостерігався у сім'ях, які проживали не у власних будинках, безробітних матерів чи батьків, чи родин без вищої освіти. Модель логістичної регресії показала, що найважливішими факторами депресії матерів є відсутність майнових прав на житло ($p = 0,01$), наявність хворого члена в сім'ї ($p = 0,02$) та відсутність чоловіка ($p = 0,03$). Отже, за результатами дослідження нестача продуктів може бути причиною депресії.

Ключові слова: продовольча незахищеність, депресія, соціально-економічний стан, жінки, харчування, дієта.

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