Nutrition, Infertility and Common Mental Disorders: A Case-Control Study of Women in Reproductive Age

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ABSTRACT: Nutritional status and food consumption are critical factors affecting women's mental health. Nutrition also aids in enhancing reproductive health of infertile women by nutritional management and prevention of infertility. To determine the association between mental health and diet diversity among fertile and infertile women of Delhi NCR. The current study was designed for determining the link between Diet diversification and mental health disorders among infertile and fertile women. No association has been found between nutritional status and infertility. However, it was observed that low or poor food diversity might cause more anxiousness and stress among infertile women. Though food is supposed to be associated with mental health disorders but in the case of fertile women, none of the psychological variables (stress, anxiety, and depression) was found to be associated with nutritional status, which signifies that low nutritional intake might aggravate the mental health disorders (anxiousness and stress levels) of infertile women, unlike fertile women. Diet being the modifiable factor, can be a controlling variable for mental health disorders among infertile women. Thus, a nutritious diet can be recommended during infertility treatment to prevent mental health disorders among women.

INTRODUCTION

World Health Organization (WHO) estimated that infertility affects 8-12 per cent of couples worldwide (Hsu and Kuo, 2002; WHO, 2020) and the number of couples trailing treatment has risen dramatically in recent years. Literature reported that the prevalence of stress, anxiety, and depression in infertile couples is indispensably higher than fertile couples (Doyle and Carballedo, 2014). Mental health forms an indigenous and critical part of human health. Inadequate nutrition and poor diet have been cited as the reasons for multidimensional causative factors for the cause or development of mental and physical health disorders (Black and Bowman, 2020; Jacka *et al*., 2011; Rattan and Kyriazi, 2019; Weng *et al*., 2012). Mental health disorders such as depressive or eating disorders have been linked to infertility in the past, assuming it as a bidirectional relationship (Schweiger, Schweiger and Schweiger, 2018). The nutritional status has been closely linked to the reproductive axis of

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women, mainly with the inadequate diet of females and with the detectors found in inhibitory pathways present in the hindbrain resulting in the suppression of ovulation in subjects having weight loss. Consequently, inadequate diet leading to weight loss has been associated with compressed frequency or cessation of ovulation (Nutrition and reproduction in women, 2006). Nutrition and fertility are interrelated and seem essential for women's reproductive success and the interaction between metabolic and ovulatory problems, suggesting that diet may have an etiological role in some infertility variations (Livshits and Seidman, 2009). UNICEF also reported that women's diets in India are often too poor to meet their nutritional needs (Women's Nutrition, n.d.). In support of this, National Health Family Survey-4 reported that a quarter of women of reproductive age in India are undernourished (National Family Health Survey (NFHS-4) 2015-16: India, 2017). The role of nutrition in fertilization is essential, leading to providing guidelines to the nutritional management of infertile women (Rich-Edwards *et al*., 1994). Since mental health disorders are more prevalent among infertile women, diet being the modifiable lifestyle factor, can help infertile women prevent and manage mental disorders. Therefore, the present study aims to determine the association between mental health and diet diversity in fertile and infertile women of Delhi-NCR.

MATERIAL & METHODS

Five hundred women were recruited for the present study, including 250 women with primary infertility problem and 250 fertile women. A detailed version of the research methodology is in the attached supplementary sheet as the above methodology has been communicated elsewhere.

Dietary diversity score measurement: All the participants were administered with 24-hour diet recall questionnaire via face-to-face interviews. Diet diversity score (DDS) was calculated using the Food and Agriculture Organization (FAO) standards from 2013 (Azadbakht and Esmaillzadeh, 2010; Arimond *et al*., 2010), which established a scoring system based on the values of 24-hour diet recall questionnaire. Food groups considered were cereals/roots, vegetables, fruits, legumes/lentils, meat/fish/egg & milk/dairy products. If individual eats any quantity of any food group at least once per day, was taken into count. The diet diversity score (DDS) was calculated based on the minimum consumption of at least half a serving of one food from each food group specified. The diet diversity score was calculated by adding the results from all food groups together. Each food category consumed received a score of 1, with a maximum score of 9. Regardless of the purpose of specific nutrients, it is crucial to note that there are a variety of specific compounds found in various diets and their potential interactions with other nutrients. As a result, dietary pattern analysis appears to be more rational than evaluating individual nutrients or foods (Slattery, 2010).

Statistical Analysis: The quantitative data were analysed using descriptive statistics such as mean, standard deviation, frequencies, and percentages. An independent t-test was performed to compare the mean values of diet diversity scores of infertile and fertile women. Pearson's chi-square test was carried out for comparing categorical data. Further, spearman's correlation was performed to observe the association of anxiety, stress, and depression with diet diversity score among infertile and fertile women. SPSS, IBM version 24, was used for all statistical analysis and a significance level of 0.05 was chosen.

RESULTS

In total, 500 women were interviewed during the study, among which 250 were primary infertile, and 250 were fertile. The mean age of infertile and fertile women was 27.104±3.74. Infertile women were shown to have much higher stress, anxiety, and depression than fertile women, which is communicated elsewhere (Mahajan *et al*., 2022). (Supplementary sheet).

TABLE 1

Comparison of mean values of diet diversity scores in infertile and fertile women.

Diet Diversity	Infertile Mean± S.D.	Fertile Mean± S.D.	t value (p –value)
Diet Diversity Score (DDS)	3.372 ± 1.20	3.47 ± 0.97	-1.016 (0.35)

p value <0.05 is significant; S.D. = Standard Deviation

There seems to be no significant difference in the diet diversity score mean values between infertile and fertile women as suggested in Table 1.

TABLE 2

The distribution of individuals with low, medium, and high nutrition in infertile and fertile women as per diet diversity score.

Diet Diversity Scores	Infertile	Fertile	P value
Low Nutrition	129(51.6)	115(46)	0.422
Medium Nutrition	116(46.4)	132(52.8)	
High nutrition	5(2)	3(1.2)	
Total N	250	250	

N is sample size, Level of significance (p<0.05)

Low nutrition among infertile women was found to more (51.6%) as compared to the fertile women (46%), though not showing any significant difference (p= 0.422), as indicated in Table 2.

TABLE 3

The distribution of individuals with low, medium, and high nutrition with respect to the three psychological variables in infertile and fertile women.

	Low Nutrition	Medium Nutrition	High Nutrition	P value
Infertile Women (N=250)				
Depression				
Non-Depressed (n=58)	25(43.10)	32(55.17)	1(1.7)	0.311
Depressed (n=192)	104(54.2)	84(43.7)	4(2.0)	
Stress				
Non-Stressed (n=33)	12(36.4)	19(57.6)	2(6)	0.053
Stressed (n=217)	117(53.9)	97(44.7)	3(1.4)	
Anxiety				
Non-Anxious (n=141)	64(45.4)	75(53.2)	2(1.4)	0.046**
Anxious (n=109)	65(59.6)	41(37.6)	3(2.7)	
Fertile Women (N=250)				
Depression				
Non-Depressed (n=191)	86(45)	102(53.4)	3(1.6)	0.563
Depressed (n=59)	29(49.2)	30(50.8)	0(0)	
Stress				
Non-Stressed (n=88)	41(46.6)	45(51.2)	2(2.3)	0.501
Stressed (n=162)	74(45.7)	87(53.8)	1(0.6)	
Anxiety				
Non-Anxious (n=241)	109(45.3)	129(53.5)	3(1.3)	0.438
Anxious (n=9)	6(66.7)	3(33.3)	0(0)	

N is sample size, Level of significance (p<0.05)

Depression and stress are more in low nutritional levels, though not significant among infertile women. More anxious individuals are found more in low nutritional level showing a significant difference (p<0.05) in infertile women.

However, in fertile women, higher depression and anxiety were observed to be more in low nutritional levels without showing any significant difference. Fertile women who are more stressed are more in medium nutritional levels with no significant difference (see Table 3).

TABLE 4

Association of psychological variables (anxiety, stress, and depression) with Diet Diversity Score through Spearman's Correlation.

	Anxiety Pearson coefficient (p value)	Stress Pearson coefficient (p value)	Depression Pearson coefficient (p value)
Infertile	-.119 (0.061)	-.140*(0.027)	-.034(0.592)
Fertile	-.081 (0.201)	-.007(0.915)	-.063(0.323)

Level of significance (p<0.05

Further, spearman's correlation analysis was carried out to determine the association of diet diversity scores with anxiety, stress, and depression. Nutritional status was found to be negatively corelated with anxiety and depression though not significant in infertile women. Low nutritional status was significantly associated with high stress among infertile women, implying that infertile women with lower nutrition had more stress. However, in the case of fertile women, none of the psychological variables, i.e., anxiety, stress, and depression, are significantly associated with nutritional status. Despite insignificance, higher anxiety, stress, and depression are found to be associated with lower nutrition among fertile women (see Table 4).

DISCUSSION

In the present study, it has been observed that infertile women are slightly lower in nutritional status than fertile women, though not significant. It has been reported in recent studies that a well-balanced portion of carbohydrates, proteins, lipids, folate, and antioxidants in a regular diet is beneficial for the unsurpassed reproductive health of females, which reduces the risk of infertility (Ahmed *et al.*, 2019; Broughton and Moley, 2017; Silvestris, Lovero and Palmirotta, 2019). A paucity of nutrition among anxious women has been found among infertile women, which further concludes that infertile women who are low in nutrition are more prone to develop anxiety. The study's findings are consistent with those of Jacka *et al.* (2011), who reported that a healthy diet was inversely associated with anxiety owing to poor and western eating behaviours, which are known to increase the risk of anxiety. Better mental health was found to be linked with higher scores on a healthy diet (more fruits, low-fat meat, vegetables, and whole grains) (Jacka *et al.*, 2010). However, in the present study, depression does not show an association with diet diversity among infertile women. Contrary to that, Poorrezaeian *et al.*, (2017) reported that diet diversity score and depression among women are significantly associated. In addition to anxiety, stress has also been found to be associated with low nutritional levels in infertile women. Infertile women with inadequate nutrition are more likely to develop stress. The results are per the study by Negro-Vilar (1993), which states that nutrition has a crucial role in infertility, and nutrition disorders or under-nutrition have a significant association with stress in infertility. Further, the findings of a study by Poorrezaeian *et al.* (2017), reported that stress and diet diversity scores are not significantly associated, which contradicts the current research results (Poorrezaeian *et al.*, 2017). Though food is supposed to be related to mental health disorders in the case of fertile women, none of the psychological variables (stress, anxiety, and depression) was found to be associated with nutritional status, which signifies that low nutritional intake might aggravate the mental health disorders (anxiousness and stress levels) of infertile women, unlike fertile women. Infertile women's stress and anxiety levels may be affected by the body's usage of calories and nutrients in many ways. A deficiency may emerge if one does not eat a nutritious diet, further increasing the stress and anxiety among infertile women. Similarly, stress triggers a cascade of behaviours that can harm eating patterns and eventually lead to other health problems down the road (Gonzalez and Miranda-Massari, 2014). Stress and anxiety have deleterious effects on health but eating food low in nutrition while stressed or anxious synergistically leads to metabolic havoc in infertile women.

CONCLUSION

The current study was designed for determining the link between diet diversification and mental health

disorders among infertile and fertile women. No association has been found between nutritional status and infertility. However, it was observed that low or poor food diversity might cause more anxiousness and stress among infertile women. Though food is supposed to be associated with mental health disorders but in the case of fertile women, none of the psychological variables (stress, anxiety, and depression) was found to be associated with nutritional status, which signifies that low nutritional intake might aggravate the mental health disorders (anxiousness and stress levels) of infertile women, unlike fertile women. Diet, the modifiable factor, can be used as a controlling variable for mental health disorders among infertile women. Thus, a nutritious diet can be recommended during infertility treatment to prevent mental health disorders among women.

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Availability of data and materials: The dataset used and analysed during the current study is available from the corresponding author on reasonable request.

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