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A STUDY ON THE FACTORS RESPONSIBLE FOR THE SYMPTOMS OF DEPRESSION AMONG INDIVIDUAL WITH LOWER VITAMIN D LEVELS

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Abstract:

Objective: *This research aims to determine the factors that are responsible for the symptoms of depression among individuals with lower vitamin D levels.*

Methods: *The current study adopted an approach that is exploratory study design which is deductive in nature such that the generalized observations on the relationship between depression and vitamin D deficiency can be specified into certain sections for better correlation and understanding. The sample size undertaken for the study was 811 in order to better understand the factors responsible and their contribution towards the formation of link between depression and vitamin D deficiency.*

Results: *The study included 811 participants. The most frequent weight among them was 66-75 kg (n= 296, 36.5%) followed by 51-65 kg (n= 207, 25.5%). The most frequent height among study participants was 151-160 cm (n= 319, 39.3%) followed by 161-170 cm (n= 268, 33%). The most frequent body mass index value among study participants was 18.5-24.9 kg/m^2 (n= 323, 39.8%) followed by 25-29.9 kg/m^2 (n= 273, 33.7%). Skin color varied among study participants with most of them had medium skin color (n= 372, 45.9%) followed by fair skin color (n= 345, 42.5%) and the least common skin color is morena (n= 94, 11.6%). The perceived daily calorie intake varied among study participants with most of them had 2000-2999 Kcal. Participants physical activity was low. The most frequent food was rice (n= 245, 30.2%) followed by dairy products (n= 186, 22.9%). Social connection was average among most of participants (n= 372, 45.9%) and good among 352 participants (43.4%). On the contrary, it was bad among 87 participants (10.7%).*

Conclusion: *Study results showed that most of study participants are overweight according to their BMI. Most common skin color was medium followed by fair skin. Participants eat high calorie intake. They experience sun burning sensations often. Their daily intake relies on rice and dairy products. Their physical activity is low. In addition, most of study participants had good social connection.*

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INTRODUCTION:

Depression is a widespread and debilitating mental disorder that affects people of all ages, sexes, and ethnic backgrounds equally severely. Only 4.4% of the global population had major depression in 2015 [1]. An higher risk of cardiovascular disease, suicide, and other lifestyle-related illnesses including diabetes and hypertension contribute to the condition's negative health outcomes [2,3,4]. Negative economic and societal effects include higher healthcare expenses and lower productivity [5,6]. To make matters worse, there is a substantial burden of nonresponse to standard treatment choices for depression [7,8].

Given the above, mental health professionals and academics are always on the lookout for new treatments for depression. Inflammation as a pathophysiological process in depression has received increased interest from researchers over the last quarter of a century. Although anti-inflammatory medicines have showed potential in many clinical studies, the data is not yet sufficient to support therapeutic recommendations [9,10].

Vitamin D's role in preventing and treating depression, meantime, has been the subject of a growing body of study. There are now at least three pieces of evidence supporting this link: First, vitamin D receptors (VDRs) are highly expressed in brain regions like the prefrontal and cingulate cortices that are known to play a key role in mood regulation [11]. Second, vitamin D has been proposed to play a modulatory role in the association between depression and inflammation (through a possible immune-modulatory mechanism) [12,13]. Finally, new information is emerging about the neuroprotective properties of vitamin D (by virtue of its anti-inflammatory effects) [14–15].

Researchers have found that low vitamin D levels in people can be attributed to a number of factors, including a lack of exposure to daylight and inadequate wholesome intake [16]. The lack of dairy in their diets and the fact that their skin is paler make people more susceptible [17-20]. Thus, this research aims to determine the factors that are responsible for the symptoms of depression among individuals with lower vitamin D levels.

METHODS:

Study design:
The current study adopted an exploratory study design in order to understand the relationship between depression and vitamin D deficiency in individuals and predict an outcome.

Study approach:
The current study adopted an approach that is deductive in nature such that the generalized observations on the relationship between depression and vitamin D deficiency can be specified into certain sections for better correlation and understanding.

Study population:
The participants for the current study were individuals belonging to the age group 18-75. This age group is chosen as the major influence of vitamin D deficiency and different physical and mental health issues is observed within this group.

Study sample:
The sample size undertaken for the study was 811 in order to better understand the factors responsible and their contribution towards the formation of link between depression and vitamin D deficiency.

Study tool:
For the current study, questionnaire was adopted for data collection, which was also categorized as a study tool.

Data collection:
The participants were contacted via different social media channels to create awareness about the topic and were shared the link of the forms to gather their responses. The survey comprised of 14 questions which critically aimed to decipher the lifestyle and diet factors, daily exercise limit, BMI value, Height,

weight, any continuing health condition, and overall quality of life.

Data analysis:
Descriptive analysis in the form of tables and charts was undertaken for better understanding. Furthermore, for the establishment of a positive correlation, logistic regression were conducted with the help of SPSS software.

Ethical considerations:
Informed consent from the participants after making them understand about the research aims and objectives and the harms associated with the study was undertaken. The data collected was stored in password protected folders in a computer which was accessible only by the author to eliminate the chance of bias and false reporting.

RESULTS:
The study included 811 participants. The most frequent weight among them was 66-75 kg (n= 296, 36.5%) followed by 51-65 kg (n= 207, 25.5%). Figure 1 shows the weight distribution among study participants. The most frequent height among study participants was 151-160 cm (n= 319, 39.3%) followed by 161-170 cm (n= 268, 33%). Figure 2 shows height distribution among study participants. The most frequent body mass index value among study participants was 18.5-24.9 kg/m^2 (n= 323, 39.8%) followed by 25-29.9 kg/m^2 (n= 273, 33.7%). Figure 3 shows the distribution of BMI among study participants.

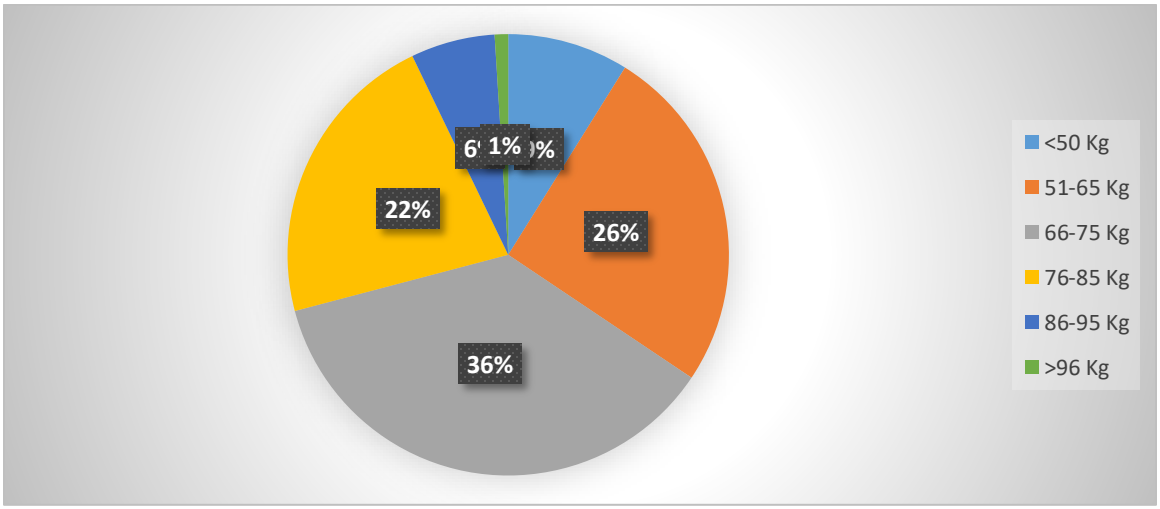

Figure 1: Weight distribution among study participants

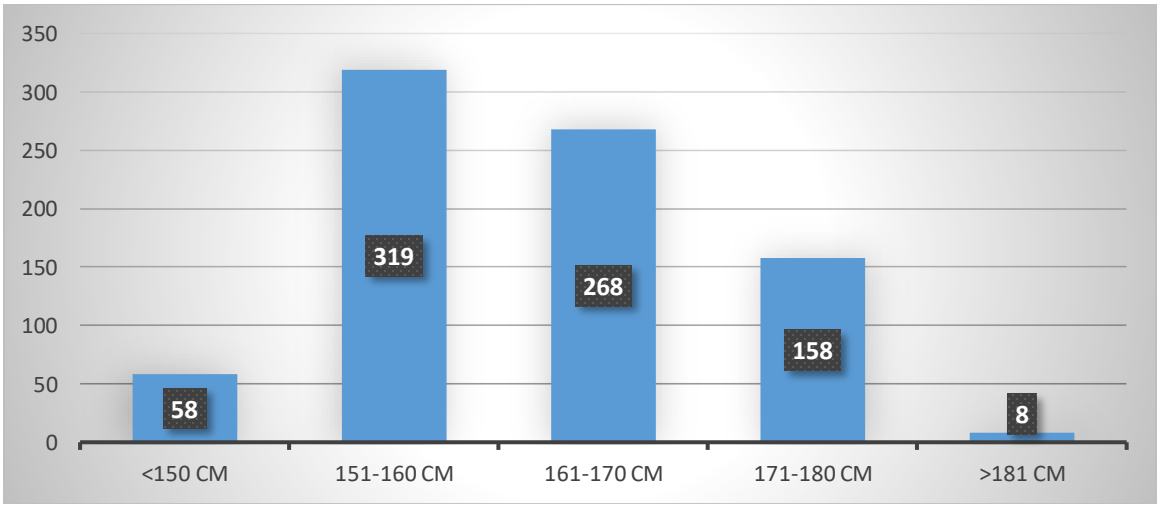

Figure 2: Height distribution among study participants

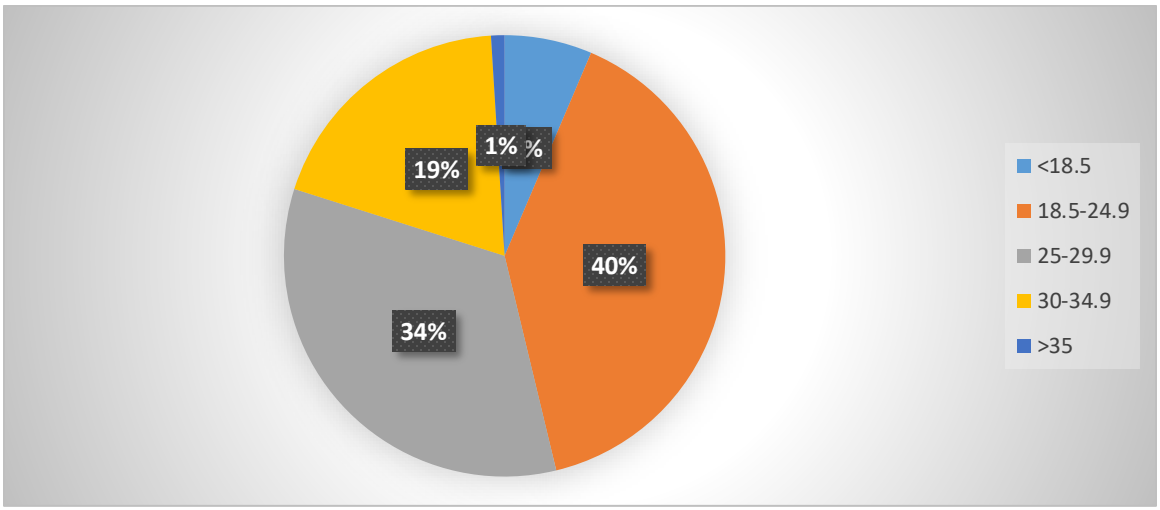

Figure 3: BMI distribution among study participants

Skin color varied among study participants with most of them had medium skin color (n= 372, 45.9%) followed by fair skin color (n= 345, 42.5%) and the least common skin color is morena (n= 94, 11.6%).

The perceived daily calorie intake varied among study participants with most of them had 2000-2999 Kcal. Perceived daily calorie intake is presented in figure 4.

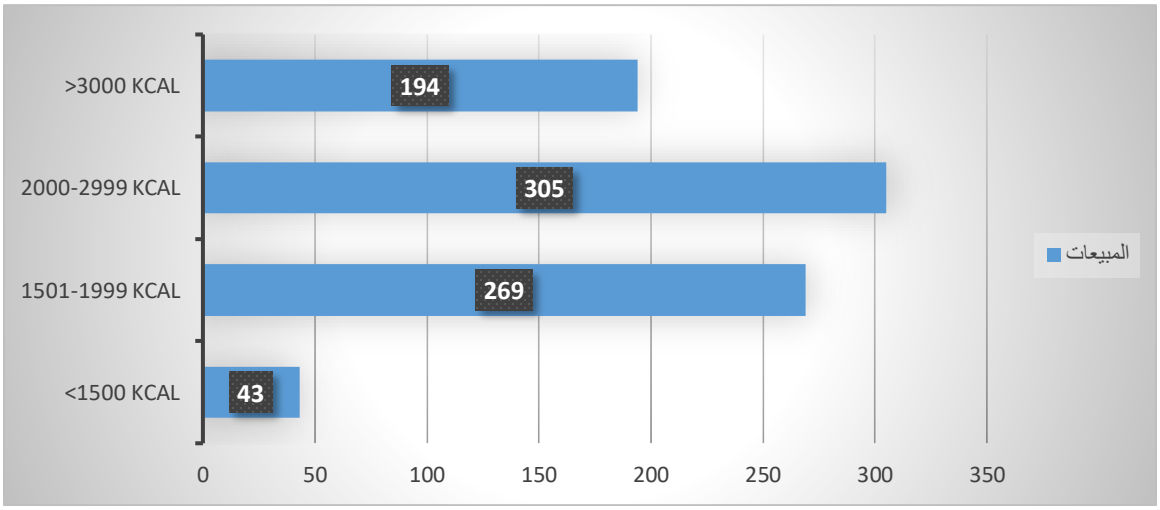

Figure 4: Daily calorie intake distribution among study participants

Participants were asked if they experience sun damage to their skin. There were fifth of participants experience burning sensation (n= 163, 20.1%). On the other hand, 344 participants had no extensive sun damage (42.4%) and 304 participants who cannot say (37.5%).

Participants were asked to assess their physical activity level. Their responses and results are presented in table 1.

Table 1: Physical activity level among study participants

Survey item		Frequency (%)
Do you exercise in the morning?	Yes	144 (17.8%)
	No	344 (42.4%)
	Cannot find time	323 (39.8%)
How much of your time in a day do you contribute for exercise?	<30 mins	381 (47%)
	31-45 mins	310 (38.2%)
	46-59 mins	70 (8.6%)
	>60 mins	50 (6.2%)
What are the forms of exercise that you do?	Flexibility training	236 (29.1%)
	Strength training	318 (39.2%)
	Cardio workout	257 (31.7%)

Participants were asked about their daily intake of foods. The most frequent food was rice (n= 245, 30.2%) followed by dairy products (n= 186, 22.9%). The consumption of fruits was found among 67 participants (8.3%) and vegetables among 139 participants (17.1%). Participants eat fruits at a frequency of 2-4 times per day (n= 365, 45%) and one time per day (n= 364, 44.9%) while 82 participants reported eating fruits more than five times per day (10.12%).

Participants spent various time in the sun. Figure 5 shows participants' sun exposure per day.

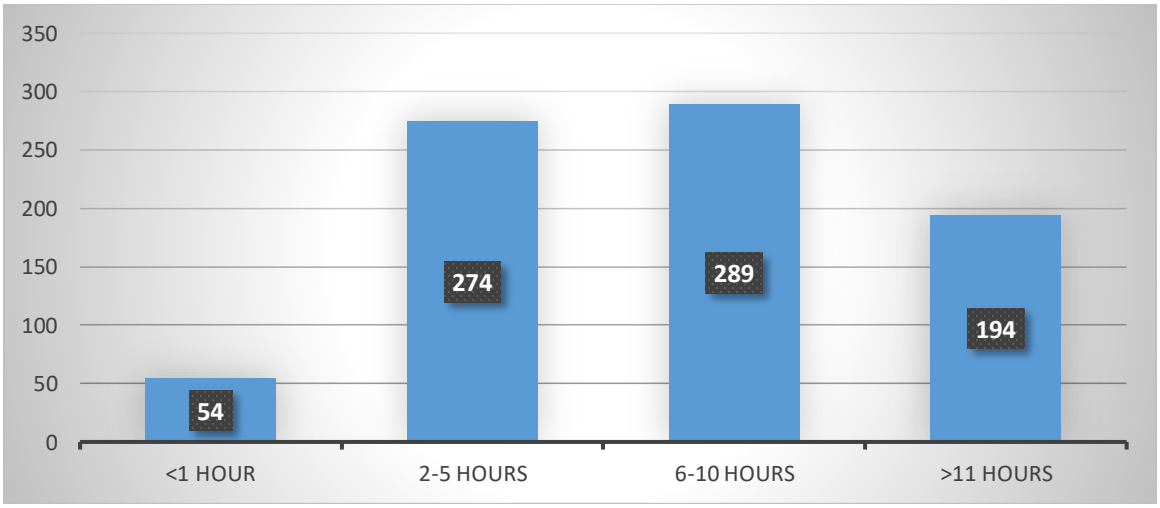

Figure 5: Participants' sun exposure duration per day

Social connection was average among most of participants (n= 372, 45.9%) and good among 352 participants (43.4%). On the contrary, it was bad among 87 participants (10.7%).

DISCUSSION:

More over 300 million individuals worldwide suffer from depression, making it the biggest cause of disability [21]. Increased mortality, decreased productivity, and greater direct and indirect healthcare expenses have all been linked to depression [22–24]. Recent studies emphasize the possible relevance of novel biological variables that may alter mood, yet the etiology and pathophysiology of depression remain poorly understood. For example, vitamin D's biological plausibility in linking brain activity and depression [25] stems from the presence of vitamin D receptors in the brain and the vitamin's key role in the responses of the immune and nervous systems; conversely, hypovitaminosis D, or insufficiency or deficiency of vitamin D, indicates an underlying biological susceptibility for depression [26].

Worldwide, hypovitaminosis D is a major public health issue. One billion individuals globally are thought to be deficient in vitamin D, whereas half of the population is insufficient [27], with a higher frequency of hypovitaminosis D also being reported in

regions with plenty of sunlight [28,29]. 25-hydroxyvitamin D [25(OH)D], the primary circulating form of vitamin D, is deficient in a large percentage of the population worldwide [30]. However, older persons are at a greater risk of hypovitaminosis D than younger adults because of the decline in vitamin D absorption from diet and skin synthesis by UVB-irradiation from sun exposure that occurs with age [29,31].

While it is well-known that vitamin D is necessary to keep serum calcium and phosphorus levels within a healthy physiologic range for musculoskeletal health, observational studies have found that low vitamin D is associated with a variety of non-skeletal health conditions [29,32-34], including symptoms of depression. Researchers Hoogendijk and colleagues [35] observed that depressive persons had 14% lower levels of 25(OH)D than non-depressed individuals among a sample of 1282 adults aged 65–95 years old from the Longitudinal Aging Study Amsterdam (assessed using the Centre for Epidemiologic Studies Depression scale). Other cross-sectional studies have found similar associations between depressive symptoms and vitamin D levels across age groups, settings, and both healthy non-institutionalized populations and in patients with medical comorbidities [38-44]. There are, however, two exceptions to this pattern (36,37).

The question of whether low 25(OH)D levels are a symptom of depression or a cause of it cannot be answered by cross-sectional research. Longitudinal studies of vitamin D and depression within cohorts have attempted to shed light on the topic. Depending on the comparison categories and thresholds used, the results of a meta-analysis of three cohort studies published in 2013 were inconsistent [45]. Similar ambiguous findings were found in other recent longitudinal studies based on population data including older men and women as well as adolescents [46-48]. The correlation between vitamin D deficiency at baseline and depression was also discovered by Ronaldson and colleagues [49] using data from the UK Biobank gathered on people aged 40 to 69 years. However, without taking into account fluctuations in vitamin D levels over time, all of these longitudinal studies have only explored relationships between vitamin D levels assessed at a single moment in time (often at baseline) and either changes in depression or depression at follow-up. This is a serious mistake since vitamin D levels may fluctuate throughout the year [50].

CONCLUSION:

Study results showed that most of study participants are overweight according to their BMI. Most common skin color was medium followed by fair skin. Participants eat high calorie intake. They experience sun burning sensations often. Their daily intake relies on rice and dairy products. Their physical activity is low. In addition, most of study participants had good social connection.

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ANNEX 1: DATA COLLECTION TOOL

1. What is your weight?
    - <50 Kg
    - 51-65 Kg
    - 66-75 Kg
    - 76-85 Kg
    - 86-95 Kg
    - >96 Kg
2. What is your height?
    - <150 cm
    - 151-160 cm
    - 161-170 cm
    - 171-180 cm
    - >181 cm
3. What is your BMI value?
    - <18.5
    - 18.5-24.9
    - 25-29.9
    - 30-34.9
    - >35
4. What is your skin colour like?
    - Fair
    - Medium
    - Morena
5. Is there extensive sun damage in your skin leading to burning sensations?
    - Yes
    - No
    - Cannot say
6. What is your perceived daily calorie intake?
    - <1500 Kcal
    - 1501-1999 Kcal
    - 2000-2999 Kcal
    - >3000 Kcal
7. Do your exercise in the morning?
    - Yes
    - No
    - Cannot find time
8. How much of your time in a day do you contribute for exercise?
    - <30 mins
    - 31-45 mins
    - 46-59 mins
    - >60 mins
9. What are the forms of exercise that you do?
    - Flexibility training
    - Strength training
    - Cardio workout
    - Others: please specify _____
10. What is your daily intake of foods including? Choose as per best understanding
    - Fruits
    - Vegetables
    - Lentils
    - Rice
    - Wheat products

- Chocolate
- Soda
- Dry fruits
- Dairy products
- Others: please specify _____

11. Do you include dairy in your diet?
    - Yes
    - No
12. How many fruits do you eat in a day?
    - <1
    - 2-4
    - >5
13. How much of your time do you spend in a day out in the sun?
    - <1 hour
    - 2-5 hours
    - 6-10 hours
    - >11 hours
14. How well is your social connection with individuals?
    - Good
    - Average
    - Bad