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RESEARCH ARTICLE
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CORRELATION BETWEEN SERUM MICRONUTRIENTS AND PSYCHOLOGICAL WELLBEING IN PHASE 1ST MBBS STUDENTS

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Abstract:

Introduction/Background: There is limited literature assessing the combined biochemical and psychological profile of MBBS students. This study seeks to fill that gap by aims to assess the correlation between serum micronutrient levels (magnesium, iron, vit D_3, B_{12}, and hemoglobin) and psychological distress (e.g., depression, anxiety, stress) in Phase 1st MBBS students.

Materials and Method: This cross-sectional study was conducted after taking informed consent from the 100 participants (phase 1st MBBS students) a questionnaire was given to evaluate their psychological wellbeing and 5ml venous blood sample was collected in plain tube, analysed for serum micronutrients like magnesium, Iron, Vit D_3, B_{12} and Hemoglobin.

Results and conclusion: The mean ± SD values of magnesium were 1.79 ±0.53, iron was 83.20± 29.62, Vit D_3 was 14.64 ± 6.58, Vit B_{12} was 220.77±45.30 and Hemoglobin was 11.93 ±2.65. Psycological state was evaluated using mental illness assessment score ranging from 0 to 26. Students with low serum levels of iron, Vit B_{12} and Hemoglobin were presented with increased symptoms of depression, anxiety, fatigue, impaired concentration and sleep. Deficiency in magnesium were presented with mood changes and cognitive performance. Deficiency in Vit D_3 were presented with mood changes, fatigue and loss of interest in their hobbies. Because of this psychological distress showing effect on academic attendance. This study was showing a strong positive correlation between attendance and psychological score (r = 0.90), with significantly reduced attendance in the severe group (76.77%) compared to the normal group (94.93%). This study will be helpful to evaluate the mental status and in correcting their nutritional deficiency by supplementation of micronutrients and also useful in improving their academic performance.

Key words: Phase 1st MBBS, Psychological wellbeing and Micronutrients.

Introduction:

Micronutrients such as iron, vitamin D_3, vitamin B_{12}, and magnesium play vital roles in neurocognitive functioning and mental health. Emerging evidence links deficiencies in these nutrients with increased risk of depression, anxiety, poor cognitive performance, and fatigue in young adults, including university students [1-5]. Among Indian medical students, there is growing concern over psychological distress. Studies reported Prevalence of depression, anxiety and stress were 59%, 43% and 11%, respectively in south Indian privet medical colleges [6], in puducherry study prevalence of depression was found to be 48.4% in medical students [7]. Kamboj G et.al. found 61.4% depression, 69.8% anxiety and stress were 46.6% in undergraduate medical students [8]. In Delhi it was observed that 60 (32.0%), 75 (40.1%), and 82 (43.8%) students were affected by symptoms suggestive of depression, anxiety, and stress, respectively in government medical college [9]. These issues are often compounded by waste curriculum, poor lifestyle habits and inadequate nutrition, including widespread micronutrient deficiencies. 1st MBBS students are particularly vulnerable to psychological stress due to academic pressure, sleep disturbances, and poor dietary habits [10]. However, limited Indian data exist evaluating biochemical-nutritional correlates of mental health in this population. Understanding the biochemical contributors to psychological wellbeing may guide preventive and therapeutic interventions in medical students. Studies have shown deficiency of micro nutrients leads to anxiety and mental illness. Prevalence of micronutrient deficiencies in India (Age 10–19) is vit D_3 was 23.9% [11], among medical students (ages 18–24), vegetarians showed ~90% abnormal B_{12} levels, and non-vegetarians ~96% [12], iron: 23–27% of college students, with a higher prevalence in females [13], magnesium was subclinical deficiency reported in 20–35% of Indian adolescents under stress [14], and 45% anemia (Low Hemoglobin) was found in the undergraduate medical students [15]. Despite these figures, there is limited literature assessing the combined biochemical and psychological profile of 1st MBBS students. This study seeks to fill that gap by aims to assess the correlation between serum micronutrient levels (magnesium, iron, vitamin D_3, vitamin B_{12}, and hemoglobin (Hb)) and psychological distress (e.g., depression, anxiety, stress) in Phase 1st MBBS students.

Material and Methods:

This observational cross-sectional study was conducted at Department of Biochemistry, Government Medical college Nalgonda among 100 students of phase one (aged 18–22 years) and willingness to participate with informed consent and chronic illness (e.g., hypothyroidism, diabetes), psychiatric disorders under current treatment ongoing supplementation with iron, vitamin D_3, B_{12}, or magnesium, recent blood donation or acute illness in the past month were excluded from the study. The research ethics committee of Government Medical College, Nalgonda granted ethical approval for the study (approval no: GMC/NLG/2027/07; dated: 24/05/2025) and after captivating of consent from participants, for the psychological assessment a questionnaire was given to all the participants and Depression Anxiety Stress Scales (DASS-21) was used. Self-administered questionnaire scored and categorized based on validated thresholds [16] and 5ml of fasting venous blood sample was collected in a plain tube, after 30 min of blood samples were centrifuged at 3000 rpm for 5 minutes, serum separated and samples were analysed immediately, hemoglobin was analysed by Hematology analyzer (automated), Vit D_3 & Vit B_{12} by SIEMENS Healthineers - Atellica Immuno Analyser with Quality check and Iron & Magnesium was analysed by SIEMENS Healthineers - Atellica Chemistry Analyser with Quality check. All data will be analysed using MS Excel. Descriptive statistics will be used to summarize the data, with continuous variables expressed as mean ± standard deviation (SD) and categorical variables presented as percentages. The correlation between serum micronutrient levels and psychological wellbeing scores (DASS-21) will be assessed using Pearson or Spearman correlation coefficients, depending on data distribution. Group comparisons such as differences in psychological scores between micronutrient-deficient and sufficient groups will be performed using independent t-tests. A p-value of less than 0.05 will be considered statistically significant.

Results:
Our study encompassed a cohort of 100 participants, comprising 57% (n=57) females and 43% (n=43) males. The mean ± SD age of participants was 19.14 ± 0.90 years. Based on the DASS-21 score participates were categorised in to 3 groups as Normal (≥17 score) 40%, Moderate (9-16 score) 37% and Severe (0-8 score) 23% showed in the fig. no. 01.

Fig. no. 01: Showing the Distribution of participants based on the Depression Anxiety Stress Scales Score

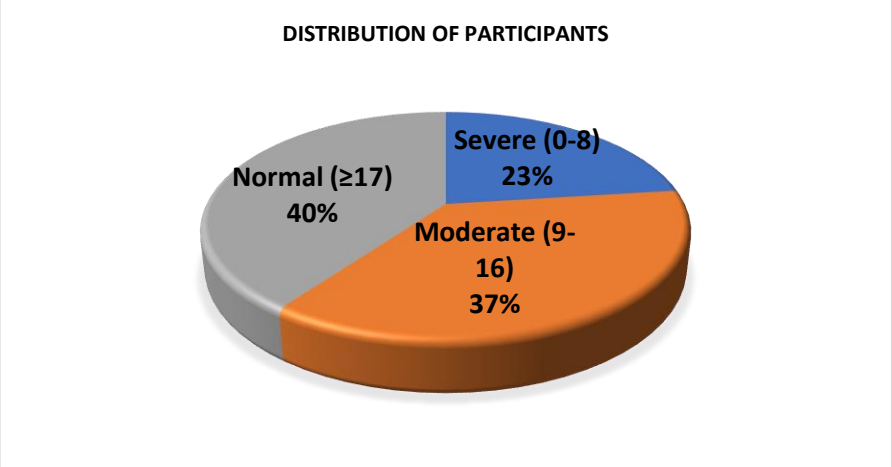

Table no. 01: Showing the Mean, SD of Age, Attendance Percentage, Score, Magnesium, Iron, Vit D_3, Vit B_{12}, and Hb

Parameters (Normal Values)	Mean	SD
Attendance%	86.39	7.81
Score	13.51	4.63
Magnesium (1.6 to 2.6mg/dl)	1.79	0.53
Iron (male 70-180 female 60 -180µg/dl)	83.20	29.62
Vit - D_3 (30-100 ng/ml)	14.64	6.58
Vit - B_{12} (120-914pg/ml)	220.77	45.30
Hb (male 13-17 female 11-15g/dl)	11.93	2.65

Table no. 02: Showing the Correlation of Attendance Percentage, Score, Magnesium, Iron, Vit D_3, Vit B_{12}, and Hemoglobin (Hb).

	Attendance%	Score	Magnesium	Iron	Vit - D_3	Vit - B_{12}	Hb
Attendance %	1.00	0.90	0.79	0.60	-0.05	0.43	0.65
Score	0.90	1.00	0.82	0.60	-0.12	0.50	0.66
Magnesium	0.79	0.82	1.00	0.42	-0.13	0.44	0.73
Iron	0.60	0.60	0.42	1.00	0.06	0.25	0.50
Vit - D_3	-0.05	-0.12	-0.13	0.06	1.00	-0.02	0.15
Vit - B_{12}	0.43	0.50	0.44	0.25	-0.02	1.00	0.35
Hb	0.65	0.66	0.73	0.50	0.15	0.35	1.00

Fig no. 02: Showing the Correlation of Attendance Percentage, Score, Magnesium, Iron, Vit D_3, Vit B_{12}, and Hemoglobin (Hb).

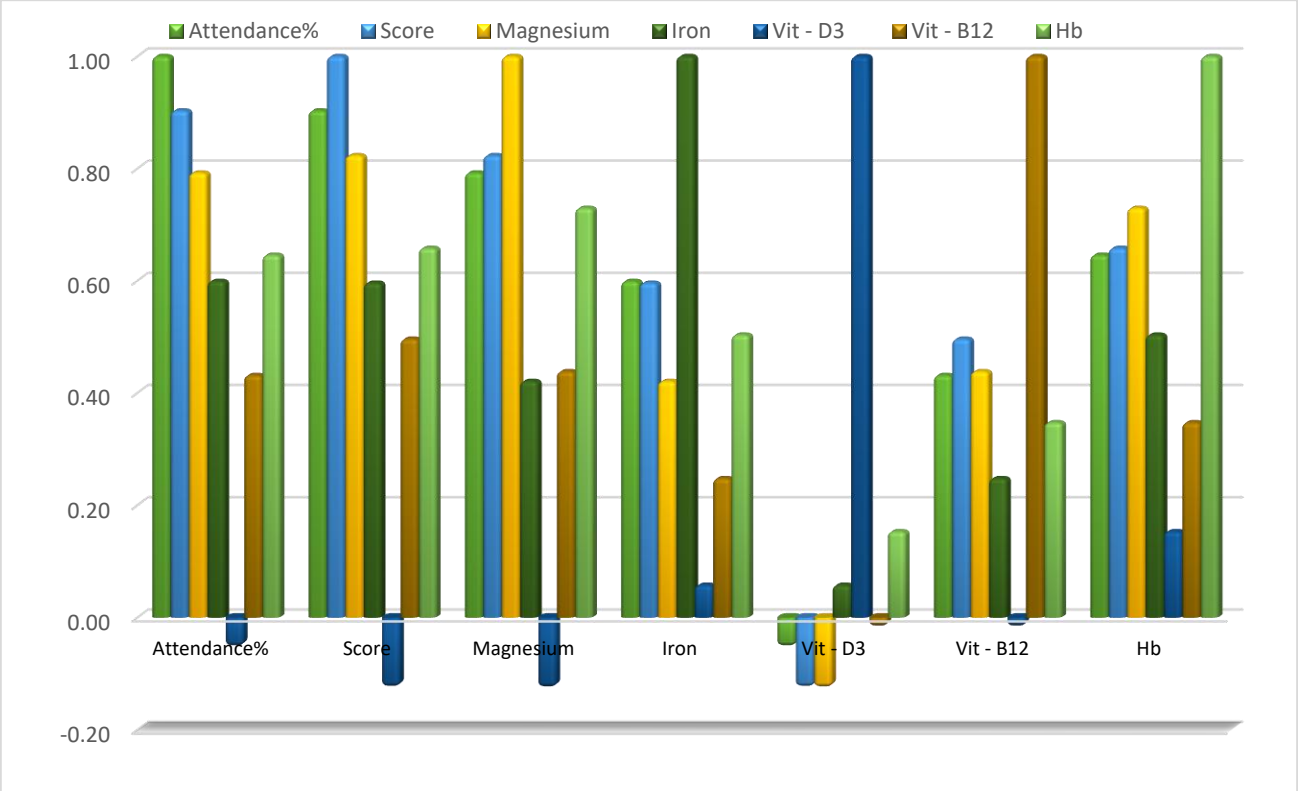

Table no. 03: Showing the Severe, Moderate and Normal groups of Mean, SD of Attendance Percentage, Score, Magnesium, Iron, Vit D_3, Vit B_{12}, and Hemoglobin (Hb).

	Severe		**Moderate**		**Normal**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
AGE	19.48	0.99	19.19	0.91	18.90	0.78
Attendance%	76.77	0.66	83.14	3.72	94.93	1.57
Score	6.83	1.07	12.73	2.12	18.08	1.12
Magnesium (1.6 to 2.6mg/dl)	1.00	0.13	1.84	0.37	2.20	0.17
Iron (male 70-180 female 60 -180µg/dl)	64.65	11.26	70.27	21.06	105.83	29.33
Vit - D3 (30-100 ng/ml)	15.11	5.61	14.85	7.51	14.18	6.30
Vit - B12 (120-914pg/ml)	178.22	12.63	230.54	49.22	236.20	38.47
Hb (male 13-17 female 11-15g/dl)	8.43	0.75	12.28	2.14	13.61	1.76

Table no. 04: Showing the Compression of Severe, Moderate and Normal groups of Attendance Percentage, Score, Magnesium, Iron, Vit D_3, Vit B_{12}, and Hemoglobin (Hb).

	Severe Vs Moderate	**Severe Vs Normal**	**Moderate Vs Normal**
AGE	0.25	0.01	0.14
Attendance%	0.00	0.00	0.00
Score	0.00	0.00	0.00
Magnesium	0.00	0.00	0.00
Iron	0.24	0.00	0.00
Vit - D3	0.89	0.56	0.67
Vit - B12	0.00	0.00	0.57
Hb	0.00	0.00	0.00

Discussion

This study evaluated the association between psychological wellbeing (assessed via DASS-21) and levels of key micronutrients (magnesium, iron, vitamin B12, and vitamin D3), hemoglobin, and attendance among 100 MBBS Phase one students. The majority (60%) of participants fell into the moderate or severe psychological distress categories, reflecting the well-documented psychological burden on medical students. Because of this psychological distress showing effect on academic attendance. This study was showing a strong positive correlation between attendance and psychological score (r = 0.90), with significantly reduced attendance in the severe group (76.77%) compared to the normal group (94.93%). This aligns with findings by Raja et al.[6]; Taneja et al. [9], who observed that reduced academic engagement in Indian medical students was significantly associated with depressive symptoms and lack of motivation. Poor mental health may lead to academic disengagement, while isolation and absenteeism may in turn exacerbate distress.

Effect of magnesium on psychological health is strongly correlating (r = 0.82) underscores its neuroregulatory role, magnesium levels were significantly lower in the severe group (1.00 ± 0.13 mg/dL) versus the normal group (2.20 ± 0.17 mg/dL). Magnesium deficiency contributes to neuronal hyperexcitability and HPA axis dysregulation, leading to increased susceptibility to stress, anxiety and depression [14]. Iron levels were also substantially lower in the severe group (64.65 ± 11.26 µg/dL) compared to the normal group (105.83 ± 29.33 µg/dL). Chan et al. highlighted that even marginal iron deficiency in young adults can impair emotional regulation and increase fatigue due to impaired dopaminergic activity [17]. The moderate positive correlation between iron and DASS-21 score (r = 0.60) in our study supports this connection.

The vit D_3 levels were found in low (mean: 14.64 ± 6.58 ng/mL) may poor exposure to the sun light, and vit D_3 levels did not significantly differ between psychological groups or correlate with DASS scores. Oraibi O et al. had previously shown a significant association between vit D_3 deficiency and mood disorders in Indian medical students [18]. The absence of significance in our study may reflect a ceiling effect, where universally low levels preclude differentiation between mental health categories. Along with this the vit B_{12} levels showed a notable gradient from the severe (178.22 ± 12.63 pg/mL) to normal group (236.20 ± 38.47 pg/mL). Chaturvedi et al. demonstrated a similar pattern in undergraduates, with B_{12} insufficiency linked to depressive symptoms and reduced cognitive function due to its role in monoamine neurotransmitter synthesis [19]. Low vit B_{12} levels impair red blood cell production by disrupting DNA synthesis, resulting in megaloblastic anemia and reduced hemoglobin levels. Screening for and correcting B_{12} deficiency, especially in high-risk populations like students under chronic stress, may help improve both haematological and psychological health [20]. In this study hemoglobin levels showed a strong association with psychological scores (r = 0.66), with the lowest values observed in the severe group (8.43 ± 0.75 g/dL). The vit B_{12} levels in the severe psychological distress group were 178.22 ± 12.63 pg/mL, and their hemoglobin level was 8.43 ± 0.75 g/dL when it compared to the normal group (B_{12} = 236.20 ± 38.47 pg/mL; Hb = 13.61 ± 1.76 g/dL), this demonstrates a strong positive correlation (r = 0.35) between vitamin B_{12} and hemoglobin levels. This supports the hypothesis that subclinical or clinical B_{12} deficiency may contribute to low hemoglobin levels even in young adults, including medical students. Anemia is directly linked to poor oxygenation and cerebral perfusion, contributing to cognitive decline and fatigue. The low serum B_{12} levels were associated not only with lower hemoglobin concentrations but also depressive symptoms with in undergraduates, reflecting early megaloblastic changes [19]. Chan et al. in their systematic review also linked B_{12} deficiency with fatigue and anemia, particularly in young adults, due to its role in red blood cell formation. Clinical studies have shown that B_{12} levels <200 pg/mL are commonly associated with anemia, with Hb levels falling below normal even before overt symptoms of neuropathy appear [21].

Conclusion:

This study supports that low levels of magnesium, iron, vit D_3, and hemoglobin are associated with greater psychological distress among medical students. Attendance and academic participation also

strongly reflect mental health status. These findings reinforce the need for integrated student wellness programs that include nutritional screening and psychological counselling.

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