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Research Article

Study of Serum Vitamin B12 and Vitamin D Level amongst Medical Professionals in Tertiary Health Care Center, Rewa

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ABSTRACT

Background: Vitamin D and Vitamin B12 are essential micronutrients required for maintenance of musculoskeletal health, neurological function, hematopoiesis, immunity, and overall well-being. Medical professionals are particularly vulnerable to deficiencies because of prolonged indoor working hours, shift duties, irregular dietary habits, stress, and limited sunlight exposure. Despite their health awareness, micronutrient deficiencies often remain undetected. The present study was conducted to assess serum Vitamin B12 and Vitamin D levels among medical professionals in a tertiary health care center at Rewa and to evaluate their association with demographic, occupational, and lifestyle factors.

Materials and Methods: A hospital-based cross-sectional study was conducted in the Department of Physiology, Shyam Shah Medical College, Rewa, over a period of 18 months (May 2024–October 2025). A total of 150 medical professionals aged 15–60 years were enrolled and equally distributed into three age groups (15–30, 31–45, and 46–60 years). Data regarding age, gender, profession, dietary habits, physical activity, work shifts, stress levels, and sunlight exposure were collected using a structured questionnaire. Serum Vitamin B12 levels were measured by chemiluminescent immunoassay and serum 25-hydroxy Vitamin D [25(OH)D] levels were estimated using standard laboratory methods. Statistical analysis was performed using SPSS version 20.

Results: Among the 150 participants, females constituted 55.33% and males 44.67%. The mean serum Vitamin B12 level was 280.78 pg/mL, while the mean serum Vitamin D level was 22.54 ng/mL, indicating borderline/insufficient status. Vitamin B12 deficiency (<200 pg/mL) was observed in 16.67% participants, insufficiency (200–300 pg/mL) in 38.67%, and normal levels in 44.67%. Vitamin D deficiency (<20 ng/mL) was present in 37.33%, insufficiency (20–29 ng/mL) in 42.0%, and normal levels in only 20.67% participants. No statistically significant association was found between age or gender and Vitamin B12 or Vitamin D status. Higher Vitamin B12 deficiency was observed among technicians, individuals with low physical activity, and those experiencing high stress, whereas Vitamin D deficiency was more common among consultants, rotational shift workers, and vegetarians.

Conclusion: Vitamin B12 and Vitamin D deficiencies are highly prevalent among medical professionals in a tertiary health care center. Occupational factors, dietary habits, physical inactivity, shift work, and stress appear to contribute to poor micronutrient status. Regular screening, nutritional counseling, lifestyle modification, and appropriate supplementation should be incorporated into institutional health programs to improve the health and productivity of healthcare workers.

Keywords: Vitamin B12, Vitamin D, Medical Professionals, Micronutrient Deficiency, Healthcare Workers.

INTRODUCTION

Vitamin D and Vitamin B12 are essential micronutrients involved in numerous physiological functions including bone metabolism, hematopoiesis, neurological function, immune regulation, and maintenance of overall health. Despite abundant sunlight and diverse dietary practices in India, deficiencies of both vitamins remain highly prevalent and constitute an important public health concern. Vitamin D deficiency has been associated with osteomalacia, muscle weakness, impaired immunity, and increased risk of chronic diseases, whereas Vitamin B12 deficiency may result in megaloblastic anemia, neuropathy, cognitive impairment, and neuropsychiatric manifestations.[1,2]

Medical professionals represent a unique occupational group that may be particularly vulnerable to these deficiencies due to prolonged indoor working hours, rotational shifts, irregular dietary habits, occupational stress, and limited exposure to sunlight. Previous studies among healthcare workers and other employed populations have reported a high prevalence of Vitamin D deficiency and substantial rates of Vitamin B12 deficiency despite adequate health awareness.[3–5] Such deficiencies often remain clinically silent or present with nonspecific symptoms including fatigue, reduced concentration, mood disturbances, and musculoskeletal discomfort, adversely affecting professional performance and quality of life.[2,6]

Although several studies have evaluated micronutrient deficiencies in different populations, region-specific data among healthcare workers in central India remain limited. Assessment of Vitamin D and Vitamin B12 status among medical professionals is therefore essential for identifying the burden of deficiency and associated occupational and lifestyle determinants. The present study was undertaken to evaluate serum Vitamin D and Vitamin B12 levels among medical professionals working in a tertiary health care center in Rewa and to explore factors associated with their deficiency.[3,7-9] Aim of the study to assess the serum levels of Vitamin B12 and Vitamin D among medical professionals in a tertiary health care center at Rewa. To evaluate the association of Vitamin B12 and Vitamin D levels with demographic, occupational, and lifestyle factors including age, gender, dietary pattern, sun exposure, physical activity, stress level, and work shifts and to compare serum Vitamin B12 and Vitamin D levels across different categories of medical professionals.

MATERIALS AND METHODS

This cross-sectional observational study was conducted in the Department of Physiology, Shyam Shah Medical College and associated Sanjay Gandhi Memorial Hospital, Rewa, Madhya Pradesh, India, over a period of 18 months from May 2024 to October 2025. The study included 150 medical professionals aged 15–60 years working in the tertiary health care center.

Participants were selected using random sampling and categorized into three age groups: 15–30 years, 31–45 years, and 46–60 years, with 50 participants in each group. Medical professionals who underwent Vitamin B12 and Vitamin D testing and provided informed consent were included. Individuals with congenital or genetic disorders, autoimmune diseases, malignancy, malabsorption syndromes, pregnancy, or severe systemic illnesses were excluded.

Data regarding demographic characteristics, profession, dietary habits, physical activity, work shift pattern, stress levels, sun exposure, supplement use, smoking, alcohol consumption, and clinical symptoms suggestive of vitamin deficiency were collected using a structured questionnaire. Venous blood samples were collected under aseptic conditions and analyzed using standard laboratory procedures.

Serum Vitamin B12 levels were measured by chemiluminescent immunoassay (CLIA). Vitamin B12 levels <200 pg/mL were considered deficient, 200–300 pg/mL insufficient, and >300 pg/mL normal. Serum 25-hydroxy Vitamin D [25(OH)D] levels were assessed using standard immunoassay methods. Vitamin D deficiency was defined as <20 ng/mL, insufficiency as 20–29 ng/mL, and sufficiency as ≥30 ng/mL. Severe deficiency was considered when levels were <10 ng/mL.

Data were entered into Microsoft Excel and analyzed using SPSS version 20. Quantitative variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Associations between variables were assessed

using Chi-square test and appropriate statistical tests. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1. Baseline Characteristics of Study Participants (N = 150)

Variable	Category	Frequency (%)
Age Group (years)	15–30	50 (33.3)
	31–45	50 (33.3)
	46–60	50 (33.4)
Sex	Male	67 (44.7)
	Female	83 (55.3)
Diet Type	Vegetarian	89 (59.3)
	Non-Vegetarian	61 (40.7)
Profession	Technician	37 (24.7)
	Resident Doctor	36 (24.0)
	Nurse	35 (23.3)
	Consultant	22 (14.7)
	Student	20 (13.3)

The study included 150 medical professionals with an equal distribution across three age groups (15–30, 31–45, and 46–60 years), ensuring balanced age representation. Females constituted a slightly higher proportion of participants (55.3%) than males (44.7%). A majority of participants were vegetarians (59.3%). Among professional categories, technicians represented the largest group (24.7%), followed by resident doctors (24.0%) and nurses (23.3%). This distribution reflects a diverse healthcare workforce and provides a representative sample for evaluating micronutrient status. (Table-1)

Table 2. Occupational and Lifestyle Characteristics of Participants (N = 150)

Variable	Category	Frequency (%)
Physical Activity	High	47 (31.3)
	Moderate	54 (36.0)
	Low	49 (32.7)
Work Shift	Day	48 (32.0)
	Night	55 (36.7)
	Rotational	47 (31.3)
Stress Level	Low	47 (31.3)
	Moderate	56 (37.3)
	High	47 (31.3)

Moderate physical activity was reported by 36.0% of participants, while low and high activity levels were observed in 32.7% and 31.3%, respectively. Night-shift workers constituted the largest occupational subgroup (36.7%), indicating substantial exposure to irregular work schedules. Moderate stress levels were reported by 37.3% of participants, whereas high and low stress levels were equally distributed (31.3% each). These findings suggest considerable occupational and lifestyle variability that may influence vitamin status. (Table-2)

Table 3. Serum Vitamin B12 and Vitamin D Status among Medical Professionals

Parameter	Category	Frequency (%)
Vitamin B12 Status	Deficient	25 (16.7)
	Insufficient	58 (38.7)
	Normal	67 (44.6)
Vitamin D Status	Deficient	56 (37.3)
	Insufficient	63 (42.0)

	Normal	31 (20.7)

Normal Vitamin B12 levels were observed in 44.6% of participants, whereas 38.7% had insufficient and 16.7% had deficient levels. In contrast, only 20.7% of participants had normal Vitamin D levels, while 42.0% and 37.3% demonstrated insufficiency and deficiency, respectively. Overall, suboptimal Vitamin D status was more prevalent than Vitamin B12 deficiency, indicating a substantial burden of micronutrient inadequacy among medical professionals. (Table-3)

Table 4. Mean Biochemical Parameters of Study Participants

Parameter	Mean Value
Vitamin B12 (pg/mL)	280.78
Vitamin D (ng/mL)	22.54
Calcium (mg/dL)	9.26
Hemoglobin (g/dL)	13.35

The mean serum Vitamin B12 concentration was 280.78 pg/mL, which falls within the borderline-insufficient range. Similarly, the mean Vitamin D concentration was 22.54 ng/mL, indicating overall insufficiency. However, mean calcium (9.26 mg/dL) and hemoglobin (13.35 g/dL) values remained within normal physiological limits. These findings suggest that micronutrient deficiencies may exist despite apparently normal routine biochemical parameters. (Table-4)

Table 5. Key Factors Associated With Vitamin B12 and Vitamin D Status

Variable	Highest Vitamin B12 Deficiency	Highest Vitamin D Deficiency
Profession	Technician – 27.0%	Consultant – 63.6%
Diet Type	Vegetarian – 15.7%	Vegetarian – 41.6%
Physical Activity	Low – 24.5%	Moderate – 46.3%
Work Shift	Night – 20.0%	Day – 39.6%
Stress Level	High – 29.8%	Moderate – 42.9%

Association	p-value
Profession vs B12	0.1128
Profession vs Vitamin D	0.0973
Diet vs B12	0.0633
Physical Activity vs B12	0.0702
Stress vs B12	0.0589

Vitamin B12 deficiency was most frequently observed among technicians (27.0%), individuals with low physical activity (24.5%), and participants reporting high stress levels (29.8%). Vitamin D deficiency was highest among consultants (63.6%), vegetarians (41.6%), participants with moderate physical activity (46.3%), and those with moderate stress levels (42.9%). Rotational shift workers demonstrated the lowest proportion of normal Vitamin D levels (8.5%). Although none of these associations reached statistical significance ($p > 0.05$), the observed trends suggest that occupational role, dietary pattern, physical activity, work schedule, and stress may influence Vitamin B12 and Vitamin D status among healthcare professionals. (Table -5)

DISCUSSION

In the present study, all age groups were equally represented, with 33.3% participants in each category (15–30, 31–45, and 46–60 years), ensuring a balanced age distribution. Similar findings were reported by Chirravuri V et al.[3] and Praveen PA et al.[10], who observed an evenly distributed working-age population. Females constituted 55.3% of the study population, which is comparable to the findings of Ganie MA et al.[11] (57.4%) and Gao F et al.[12] (60% females). A predominance of vegetarian diet (59.3%) was observed in the present study, closely matching reports by Naik S et al.[13] and Rawat S et al.[14], who documented vegetarian dietary habits in approximately 54–60% of Indian participants. Technicians formed the largest professional

group (24.7%), followed by resident doctors (24.0%) and nurses (23.3%). Similar occupational distributions among healthcare workers have been described by Nandyala S et al.[4] and Ganie MA et al.[11]. These findings indicate that the study population adequately represents different healthcare professions and dietary patterns relevant to micronutrient deficiencies. (Table-1)

Moderate physical activity was the most common pattern (36.0%), followed by low (32.7%) and high (31.3%) activity levels. Comparable findings were reported by Singh AK et al.[15] and Praveen PA et al.[10], who observed moderate physical activity in approximately 35–40% of participants. Night-shift workers constituted the largest subgroup (36.7%), similar to observations by Ganie MA et al.[11] and Martelli M et al.[16], who documented night-duty prevalence among one-third of healthcare workers. Moderate stress levels were present in 37.3% participants, closely matching reports by Gao F et al.[12] and Ganie MA et al.[11]. These findings highlight the substantial occupational burden and lifestyle variability among healthcare professionals that may contribute to altered micronutrient status. (Table-2)

The present study demonstrated that 16.7% participants were Vitamin B12 deficient and 38.7% were insufficient, indicating that more than half of the healthcare workers had suboptimal Vitamin B12 status. Similar findings were reported by Nandyala S et al.[4], who observed Vitamin B12 deficiency in 18.6% of healthcare professionals. Singla R et al.[17] also reported a high prevalence of low Vitamin B12 levels among North Indians. Regarding Vitamin D, deficiency and insufficiency were observed in 37.3% and 42.0% participants, respectively, with only 20.7% having normal levels. These findings are comparable with Ganie MA et al.[11], Praveen PA et al.[10], and Siddiqee MH et al.[5], who reported widespread Vitamin D deficiency among healthcare workers and South Asian populations. The high prevalence of hypovitaminosis D observed in the present study underscores the continuing public health significance of Vitamin D deficiency even among medically aware individuals. (Table-3)

The mean serum Vitamin B12 level in the present study was 280.78 pg/mL, while the mean Vitamin D level was 22.54 ng/mL, indicating borderline or insufficient status. In contrast, mean calcium (9.26 mg/dL) and hemoglobin (13.35 g/dL) remained within normal limits. Similar findings have been reported by Praveen PA et al.[10] and Ghosh A et al.[18], who observed low Vitamin D levels despite otherwise normal biochemical profiles. These observations suggest that Vitamin B12 and Vitamin D deficiencies may remain clinically silent and undetected if routine biochemical investigations alone are relied upon. (Table-4)

Although no statistically significant associations were observed, several important trends emerged. Vitamin B12 deficiency was highest among technicians (27.0%), participants with low physical activity (24.5%), and those experiencing high stress (29.8%). Similar occupational and lifestyle-related variations were reported by Nandyala S et al.[4], Naik S et al.[13], and Singh AK et al.[15]. Vitamin D deficiency was highest among consultants (63.6%), vegetarians (41.6%), and rotational shift workers, findings that are comparable with observations by Purohit S et al.[19], Ganie MA et al.[11], and Martelli M et al.[16]. Rotational shift workers demonstrated particularly poor Vitamin D status, likely reflecting reduced sunlight exposure associated with irregular work schedules. Although statistical significance was not achieved, the consistency of these trends suggests that occupational factors, dietary habits, physical activity, stress levels, and work schedules may contribute substantially to micronutrient status among healthcare professionals. (Table-5)

CONCLUSION

The present study demonstrated a high prevalence of both Vitamin B12 and Vitamin D inadequacy among medical professionals working in a tertiary healthcare center. More than half of the participants had suboptimal Vitamin B12 levels (55.3%), while nearly four-fifths (79.3%) exhibited Vitamin D deficiency or insufficiency. Mean serum Vitamin B12 (280.78 pg/mL) and Vitamin D (22.54 ng/mL) levels were within the borderline-insufficient range despite normal calcium and hemoglobin levels.

Age and gender were not significantly associated with Vitamin B12 or Vitamin D status. However, higher Vitamin B12 deficiency was observed among technicians, individuals with low physical activity, and participants reporting high stress levels. Vitamin D deficiency was more common among consultants, vegetarians, and rotational shift workers, suggesting a possible influence of occupational exposure, dietary habits,

reduced sunlight exposure, and lifestyle factors.

Overall, the findings indicate that healthcare professionals constitute a vulnerable group for hidden micronutrient deficiencies despite adequate medical knowledge. Regular screening programs, nutritional counseling, lifestyle modification, stress management, improved sunlight exposure, and appropriate supplementation strategies should be incorporated into institutional health policies to improve the health and productivity of healthcare workers.

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