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Impact of Sunlight Exposure and Dietary Habit on Vitamin D Status of Workers Coming from Middle East

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ABSTRACT: ***Background:*** Vitamin D deficiency is a global health concern, particularly among populations with limited sunlight exposure and restricted dietary intake of Vitamin D-rich foods. Expatriate workers from the Middle East living in tropical countries like Bangladesh represent a vulnerable group, yet their Vitamin D status remains understudied. This study aimed to assess the prevalence of Vitamin D deficiency among Middle Eastern expatriate workers in Bangladesh and investigate the association of sunlight exposure, clothing styles, and dietary habits with Vitamin D levels. ***Methods:*** A cross-sectional observational study was conducted from January to June 2018 among 100 expatriate workers recruited purposively at Comilla Medical College Hospital. Data were collected through interviews, clinical examinations, and serum 25(OH)D measurements using Chemiluminescent Enzyme Immunoassay. Statistical analysis included chi-square tests to assess associations, with $p<0.05$ considered significant. ***Results:*** The majority (65%) of participants were Vitamin D deficient, 31% were insufficient, and only 4% had normal levels. Limited sunlight exposure (≤15 minutes/day) was reported by 86% of participants, and 63% wore clothing covering their entire body. Regular consumption of sea fish ($p=0.022$) and milk ($p=0.001$) was significantly associated with better Vitamin D status, while omega-3 fatty acid supplementation showed no significant association. The use of sunblock and sunlight exposure duration were not significantly associated with Vitamin D levels. ***Conclusion:*** Vitamin D deficiency is prevalent among expatriate workers from the Middle East residing in Bangladesh, influenced by limited sun exposure, cultural clothing practices, and dietary habits. Targeted interventions, including dietary fortification and public health campaigns promoting safe sun exposure, are essential to mitigate deficiency and improve health outcomes in this vulnerable population.

Keywords: Vitamin D deficiency, Expatriates, Middle Eastern workers, Sunlight exposure, Dietary habits, Clothing styles, Bangladesh.

Article at a glance:

Study Purpose: *The purpose of this study is to assess the impact of sunlight exposure and dietary habits on the vitamin D status of workers from the Middle East.*

Key Findings: *Workers who spend most of their time indoors or wear clothing that limits sun exposure are at a higher risk of vitamin D deficiency.*

Newer Findings: *Recent studies suggest that genetic variations in vitamin D metabolism may make some workers more susceptible to deficiency despite adequate sun exposure.*

Abbreviations: *CEIA: Chemiluminescent Enzyme Immuno Assay.*

INTRODUCTION

Vitamin D is an essential fat-soluble vitamin crucial for bone mineralization, immune regulation, and metabolic processes. It facilitates calcium and phosphate homeostasis, which is critical for maintaining skeletal integrity and preventing conditions like rickets and osteomalacia. Beyond its classical role in bone health, Vitamin D deficiency has been associated with an increased risk of chronic diseases, including diabetes, cardiovascular disorders, and immune-mediated conditions, underscoring its systemic importance.[1,2] Despite its biological significance and the fact that sunlight-mediated synthesis is a major source of Vitamin D, deficiency remains a global public health concern, with an estimated one billion individuals worldwide

affected.[3] Regions such as the Middle East and South Asia report alarmingly high prevalence rates of Vitamin D deficiency despite being situated in sunlight-rich environments. In these areas, up to 90% of some populations are deficient, primarily due to lifestyle and cultural practices, including the wearing of full-body coverings that limit skin exposure to ultraviolet B (UVB) radiation.[4,5] Bangladesh, a tropical country with high UV exposure, is no exception. Studies have revealed significant Vitamin D insufficiency across various demographics, with urban residents and women disproportionately affected due to veiling, indoor lifestyles, and dietary limitations.[6,7] The determinants of Vitamin D status are multifaceted, involving both endogenous synthesis through sunlight exposure and exogenous sources from dietary intake. Sunlight exposure remains the primary source of Vitamin D; however, factors like cultural clothing, limited outdoor activities, and air pollution reduce the effectiveness of cutaneous synthesis.[4,8]

In Bangladesh, urbanization and atmospheric pollution further exacerbate these issues by blocking UVB radiation, rendering even outdoor exposure less effective.[9] Dietary factors also play a crucial role, as Vitamin D is naturally present in a limited number of foods such as fatty fish, egg yolks, and fortified products. In Bangladesh, reliance on fish is prominent, yet dietary diversity remains a challenge, particularly among expatriates who may lack access to traditional Vitamin D-rich foods or fortified options.[6,10] Expatriate workers from the Middle East, particularly those living in tropical regions like Bangladesh, present a unique population at high risk of deficiency. Despite relocating to sunlight-abundant areas, these workers often maintain cultural practices limiting sun exposure, coupled with long indoor working hours and dietary restrictions.[11] A study on Bangladeshi expatriates in the UK highlighted the persistent deficiency due to lifestyle adaptations and insufficient supplementation practices.[12]

Additionally, research on coastal populations in Bangladesh revealed that even those with high sun exposure might still exhibit low Vitamin D levels, questioning the adequacy of global sufficiency thresholds for tropical countries.[13] Such findings point to a gap in literature focusing on expatriates in tropical settings and the interplay between sunlight and dietary factors in determining Vitamin D status. Addressing Vitamin D deficiency is essential due to its widespread health implications and economic burden, particularly among vulnerable groups such as expatriates. Understanding the dual impact of sunlight exposure and dietary habits on Vitamin D status in expatriates from the Middle East living in Bangladesh could inform targeted interventions, including dietary recommendations and public health policies promoting safe sun exposure. This study aims to assess the Vitamin D status of this unique demographic and identify the relative contributions of environmental and nutritional factors, filling a crucial gap in regional and global research.

METHODS

This cross-sectional observational study was conducted between January 2018 and June 2018 in the indoor and outdoor patient departments of the Department of Medicine at Comilla Medical College Hospital. The study population comprised workers from the Middle East residing in Bangladesh. A purposive sampling method was employed to recruit 100 participants, who met the following inclusion criteria: workers from the Middle East, aged above 18 years, and of both sexes. Participants with pre-existing conditions affecting Vitamin D or calcium metabolism, such as liver or kidney disease, eating disorders, skin diseases, pregnancy, or breastfeeding, or those receiving Vitamin D or calcium supplementation were excluded. Data were collected through face-to-face interviews using a structured questionnaire, followed by clinical examinations to document relevant signs. Blood samples were obtained to measure serum levels of 25-hydroxyvitamin D [25(OH)D] using the Chemiluminescent Enzyme Immuno Assay (CEIA) method. Laboratory analysis was conducted at Life Labs, and results were submitted confidentially to the co-investigator (AA). Confidentiality was ensured by anonymizing data through coding, and no personal identifiers were recorded. Statistical analysis was performed using SPSS version 23.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics, including frequencies and percentages, were used to summarize data. Associations between categorical variables were assessed using the chi-square test, and a p-value of <0.05 was considered statistically significant. The study was approved by the relevant departmental and institutional review boards. Participation was voluntary, and informed written consent was obtained from all participants. Ethical considerations

included maintaining confidentiality, securing written permissions, and ensuring that all questions were presented in Bangla for better comprehension by the participants.

RESULTS

Table 1: Baseline characteristics among the participants (N=100)

Demographic characteristics	Number of participants	Percentage
Age (in year)		
≤20	2	2%
21-40	76	76%
41-60	21	21%
>60	1	1%
Mean ±SD	35.3	±8.4
Range (min-max)	18	-62
Sex		
Male	95	95%
Female	5	5%
Education status		
Illiterate	8	8%
SSC	70	70%
HSC	16	16%
Graduate	6	6%

The baseline characteristics of the 100 study participants are summarized in Table 1. The mean age of the participants was 35.3 years (±8.4), ranging from 18 to 62 years. The majority of participants (76%) were between the ages of 21 and 40 years, followed by 21% in the 41–60 age group, with only 2% aged 20 years or younger and 1% over 60 years. The cohort was predominantly male, with 95% of participants being men and only 5% women. Regarding educational status, 70% of participants had completed secondary school certification (SSC), 16% had attained higher secondary education (HSC), 6% were graduates, and 8% were illiterate.

Table 2: Distribution of symptoms among the participants (N=100)

Symptoms	Number of participants	Percentage
Back pain	41	41%
Muscle cramp	12	12%
Neck pain	8	8%
Headache	8	8%
Leg cramp	7	7%
HTN	7	7%
Lower abdominal pain	6	6%
Diabetes	5	5%
Dysuria	5	5%
Chest pain	4	4%
Knee pain	4	4%

Table 2 summarizes the distribution of symptoms among the study participants. Back pain was the most commonly reported symptom, affecting 41% of participants, followed by muscle cramps in

12%. Neck pain and headaches were each reported by 8% of participants. Leg cramps and hypertension were noted in 7% of participants, while 6% experienced lower abdominal pain. Diabetes and dysuria were each reported by 5% of participants. The least common symptoms included chest pain and knee pain, each affecting 4% of the cohort.

Table 3: Distribution of the study participants according to clothing style (N=100)

Clothing	Number of participants	Percentage
Cover whole body	63	63%
Cover body partially during daytime	32	32%
Use of Veil (females)	5	5%

Table 3 presents the distribution of participants based on clothing styles. Most participants (63%) reported wearing clothing that covered their whole body during the day. Partial body coverage during the daytime was reported by 32% of participants. Among the 5% of female participants, all reported the use of veils.

Table 4: Distribution of study participants according to sunlight exposure (N=100)

Exposure to Sunlight (min/day)	Number of participants	Percentage
≤15	86	86%
>15	14	14%

Table 4 illustrates the distribution of participants based on their daily sunlight exposure. A significant majority (86%) reported having 15 minutes or less of sunlight exposure per day, while only 14% were exposed to sunlight for more than 15 minutes daily.

Table 5: Distribution of dietary habits among the participants (N=100)

Dietary Exposure	Number of participants	Percentage
Eat sea fish ≥3d/week	79	79%
Drink milk ≥3d/week	52	52%
Omega-3 fatty acid (fish oil) supplementation	12	12%

Table 5 shows the distribution of dietary habits among the participants. A majority (79%) reported consuming sea fish three or more days per week, while 52% consumed milk at the same frequency. However, only 12% of participants reported using omega-3 fatty acid (fish oil) supplements.

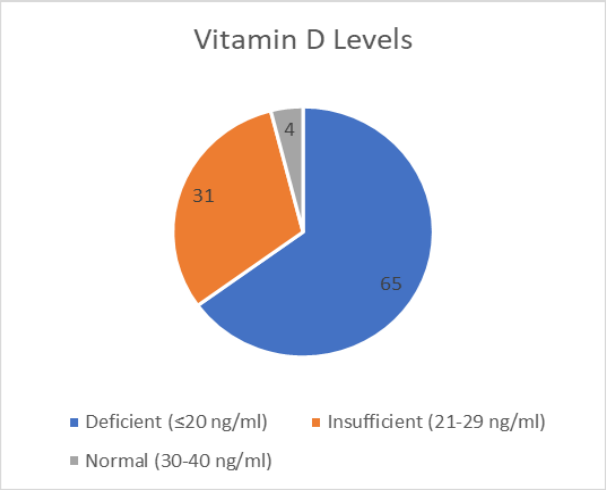

Figure 1: Distribution of participants by vitamin D levels (N=100)

Figure 1 illustrates the distribution of participants based on their Vitamin D levels. The majority of participants (65%) were found to be Vitamin D deficient (≤20 ng/ml), while 31% had insufficient levels (21–29 ng/ml). Only 4% of participants had normal Vitamin D levels (30–40 ng/ml).

Table 6: Association Between Sunlight Exposure with 25-Hydroxyvitamin D (n=100)

Sunlight expose (min/day)	Deficient (n=65)		Insufficient (n=31)		Normal (n=4)		P-value
	n	%	n	%	n	%	
≤15	52	80.00%	30	96.77%	4	100	0.061ns
>15	13	20.00%	1	3.23%	0	0	

Table 6 presents the association between sunlight exposure and 25-hydroxyvitamin D levels among the participants. Among those with ≤15 minutes of daily sunlight exposure, 80% were Vitamin D deficient, 96.77% were insufficient, and 100% of the normal group fell into this exposure category. For participants exposed to sunlight for more than 15 minutes daily, 20% were Vitamin D deficient, while only 3.23% were insufficient, and none had normal Vitamin D levels. The association between sunlight exposure and Vitamin D levels was not statistically significant (p=0.061)

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Table 7: Association Between the Use of Sun Block With 25-Hydroxyvitamin D (n=100)

Sunlight expose (min/day)	Deficient (n=65)		Insufficient (n=31)		Normal (n=4)		P-value
	n	%	n	%	n	%	
Yes	3	4.62%	0	0.00%	0	0.00%	0.435ns
No	62	95.38%	31	100.00%	4	100.00%	

Table 7 shows the association between the use of sunblock and 25-hydroxyvitamin D levels among the participants. Among Vitamin D-deficient individuals, 4.62% reported using sunblock, while none of the insufficient or normal participants reported using sunblock. The majority of participants, regardless of their Vitamin D status, did not use sunblock (95.38% deficient, 100% insufficient, and 100% normal individuals). The association between sunblock use and Vitamin D levels was not statistically significant (p=0.435).

Table 8: Association Between Dietary Information with 25-Hydroxyvitamin D (n=100)

Sunlight expose (min/day)	Deficient (n=65)		Insufficient (n=31)		Normal (n=4)		P-value
	n	%	n	%	n	%	
Eat Sea fish (≥3 d/per/weeks)	46	70.77%	29	93.55%	4	100.00%	0.022s
Drink Milk (≥3 d/per/weeks)	22	33.85%	26	83.87%	4	100.00%	0.001s
omega-3 fatty acid (fish oil) supplementation	6	9.23%	5	16.13%	1	25.00%	0.447ns

Table 8 illustrates the association between dietary habits and 25-hydroxyvitamin D levels among the participants. Regular consumption of sea fish (≥3 days/week) was reported by 70.77% of Vitamin D-deficient individuals, 93.55% of insufficient individuals, and 100% of those with normal levels, with a statistically significant association (p=0.022). Similarly, drinking milk (≥3 days/week) was significantly associated with Vitamin D levels (p=0.001), with 33.85% of deficient, 83.87% of insufficient, and 100% of normal participants reporting this habit. Omega-3 fatty acid supplementation showed no significant association (p=0.447), with 9.23% deficient, 16.13% insufficient, and 25% of normal participants using supplements.

DISCUSSION

The present study investigated the Vitamin D status of expatriate workers from the Middle East residing in Bangladesh, focusing on the interplay between sunlight exposure, dietary habits, and sociodemographic factors. Our findings revealed that 65% of participants were Vitamin D deficient, with only 4% achieving normal levels. This aligns with global trends indicating widespread deficiency even in sunlight-rich regions, particularly among populations with limited sun exposure and dietary intake of Vitamin D-rich foods.[14,15] The high prevalence of deficiency despite Bangladesh's tropical location is consistent with studies from similar regions, where clothing styles, cultural practices, and urbanization restrict effective UVB exposure.[16,17] Clothing habits played a significant role in limiting sunlight exposure among participants, with 63% covering their entire body and all female participants using veils. This is consistent with studies from Turkey and the UAE, were traditional clothing significantly reduced Vitamin D synthesis, leading to high deficiency rates.[18,19-44]

Furthermore, our finding that 86% of participants received ≤15 minutes of sunlight daily highlights are a critical barrier to adequate Vitamin D production. Comparable studies in Malaysia and East Africa similarly demonstrated a strong association between limited sun exposure and Vitamin D deficiency, even in populations living in tropical climates.[20,21] Dietary patterns among participants also contributed to their Vitamin D status. Regular consumption of sea fish was significantly associated with improved Vitamin D levels, as 100% of participants with normal Vitamin D levels reported eating fish ≥3 days/week. This finding is supported by research demonstrating that fatty fish is one of the most reliable dietary sources of Vitamin D.[12,22] Additionally, milk consumption was strongly correlated with higher Vitamin D levels (p=0.001), consistent with studies from Sweden and Spain, which emphasized the role of dairy products in improving Vitamin D status through fortification.[23,24] However, omega-3 fatty acid supplementation, reported by only 12% of participants, showed no significant association with Vitamin D levels, which aligns with studies suggesting that while omega-3 supplements improve cardiovascular health, their direct impact on Vitamin D levels is limited.[25]

The association between sunblock use and Vitamin D levels was not statistically significant in our study, with only 4.62% of Vitamin D-deficient participants reporting sunblock use. This aligns with findings from studies that highlight the minimal impact of infrequent sunscreen use on Vitamin D synthesis in most populations, as other factors such as clothing and limited exposure duration play more significant roles.[26,27] Furthermore, the lack of a statistically significant relationship between sunlight exposure and Vitamin D levels in our study (p=0.061) suggests the potential influence of additional environmental or genetic factors, consistent with observations from multi-regional studies.[28] The study underscores the multifactorial nature of Vitamin D deficiency in expatriate populations, combining limited sun exposure, restrictive clothing, and

suboptimal dietary habits. Similar observations have been reported among expatriates in the UK and UAE, where environmental, cultural, and dietary factors converge to exacerbate deficiency rates.[29] This highlights the need for tailored interventions, including public health campaigns promoting safe sun exposure and access to fortified foods or supplements, particularly for vulnerable expatriate workers. Overall, this study provides valuable insights into the determinants of Vitamin D status in expatriates living in tropical regions. While addressing individual lifestyle factors remains essential, systemic changes such as fortification policies and occupational health guidelines are necessary to mitigate deficiency on a broader scale.

CONCLUSION

This study highlights a high prevalence of Vitamin D deficiency among Middle Eastern expatriate workers residing in Bangladesh, driven by limited sunlight exposure, restrictive clothing styles, and suboptimal dietary habits. The findings emphasize the critical role of regular sea fish and milk consumption in maintaining adequate Vitamin D levels, while factors such as insufficient sunlight exposure and cultural practices further exacerbate deficiency. Although the association between sunlight exposure and Vitamin D levels was not statistically significant, the observed trends aligned with global findings underscoring the multifactorial determinants of Vitamin D status. Addressing these deficiencies requires tailored interventions, including public health campaigns promoting safe sun exposure, dietary fortification, and supplementation programs. These measures are particularly important for expatriate populations, whose unique cultural and occupational circumstances heighten their vulnerability to Vitamin D deficiency.

Authors' contributions

GMA, BM, FBR: Concept and design, data acquisition, interpretation and drafting. MC, AH and NS: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

REFERENCES

1. Pludowski P, Holick MF, Pilz S, Wagner CL, Hollis BW, Grant WB, Shoenfeld Y, Lerchbaum E, Llewellyn DJ, Kienreich K, Soni M. Vitamin D effects on musculoskeletal health, immunity, autoimmunity, cardiovascular disease, cancer, fertility, pregnancy, dementia and mortality—a review of recent evidence. Autoimmunity reviews. 2013 Aug 1;12(10):976-89.
2. Balachandran N, Salibi G, Tzenios N. The prevalence of vitamin D deficiency among different population groups and its impact on health outcomes. Special Journal of the Medical Academy and other Life Sciences. 2024 Sep 1;2(7).
3. Mendes MM, Charlton K, Thakur S, Ribeiro H, Lanham-New SA. Future perspectives in addressing the global issue of vitamin D deficiency. Proceedings of the Nutrition Society. 2020 May;79(2):246-51.
4. Grant WB, Fakhoury HM, Karras SN, Al Anouti F, Bhattoa HP. Variations in 25-hydroxyvitamin D in countries from the Middle East and Europe: The roles of UVB exposure and diet. Nutrients. 2019 Sep 3;11(9):2065.
5. Chakhtoura M, Rahme M, Chamoun N, Fuleihan GE. Vitamin D in the middle East and North Africa. Bone reports. 2018 Jun 1; 8:135-46.
6. Haque WM, Pathan MF, Sayeed MA. Vitamin D status of healthy coastal fishermen of Bangladesh. IMC Journal of Medical Science. 2019;13(2):35-9.
7. Acherjya GK, Ali M, Tarafder K, Akhter N, Chowdhury MK, Islam DU, Rahman MH, Miah MT. Study of vitamin D deficiency among the apparently healthy population in Jashore, Bangladesh. Mymensingh Med J. 2019 Jan 1;28(1):214-21.
8. Mousavi SM, Brandt A, Sundquist J, Hemminki K. Risks of papillary and follicular thyroid cancer among immigrants to Sweden. International journal of cancer. 2011 Nov 1;129(9):2248-55.
9. Roth DE, Al-Mahmud A, Kimlin M, Arifeen SE, Raqib R, Black RE, Baqui AH. Seasonal variations in vitamin D status in Bangladesh: a preliminary look at the potential role of aerosol pollution.
10. Islam MZ, Bhuiyan NH, Akhtaruzzaman M, Allardt CL, Fogelholm M. Vitamin D deficiency in Bangladesh: A review of prevalence, causes and recommendations for mitigation. Asia Pacific journal of clinical nutrition. 2022 Jun;31(2):167-80.
11. Smith N, Sievert LL, Muttukrishna S, Begum K, Murphy L, Sharmeen T, Gunu R, Chowdhury O,

Bentley GR. Mismatch: a comparative study of vitamin D status in British-Bangladeshi migrants. Evolution, medicine, and public health. 2021 Jan 1;9(1):164-73.
12. Farrar MD, Webb AR, Kift R, Durkin MT, Allan D, Herbert A, Berry JL, Rhodes LE. Efficacy of a dose range of simulated sunlight exposures in raising vitamin D status in South Asian adults: implications for targeted guidance on sun exposure. The American journal of clinical nutrition. 2013 Jun 1;97(6):1210-6.
13. Parvin M, Sarkar MK, Saha D. Profile of 25-Hydroxyvitamin D in Individuals Attending Armed Forces Institute of Pathology (AFIP), Dhaka. Journal of Enam Medical College. 2018 Feb 7;8(1):35-40.
14. Casey C, Woodside JV, McGinty A, Young IS, McPeake J, Chakravarthy U, Rahu M, Seland J, Soubrane G, Tomazzoli L, Topouzis F. Factors associated with serum 25-hydroxyvitamin D concentrations in older people in Europe: the EUREYE study. European journal of clinical nutrition. 2019 Feb;73(2):319-28.
15. Luxwolda MF, Kuipers RS, Kema IP, Dijck-Brouwer DJ, Muskiet FA. Traditionally living populations in East Africa have a mean serum 25-hydroxyvitamin D concentration of 115 nmol/l. British Journal of Nutrition. 2012 Nov;108(9):1557-61.
16. Al Attia HM, Ibrahim MA. The high prevalence of vitamin D inadequacy and dress style of women in the sunny UAE. Archives of osteoporosis. 2012 Dec; 7:307-10.
17. Alagöl F, Shihadeh Y, Boztepe H, Tanakol R, Yarman S, Azizlerli H, Sandalci Ö. Sunlight exposure and vitamin D deficiency in Turkish women. Journal of endocrinological investigation. 2000 Mar; 23:173-7.
18. Buyukuslu N, Esin K, Hizli H, Sunal N, Yigit P, Garipagaoglu M. Clothing preference affects vitamin D status of young women. Nutrition research. 2014 Aug 1;34(8):688-93.
19. Nurbazlin M, Chee WS, Rokiah P, Tan AT, Chew YY, Siti Nusaibah AR, Chan SP. Effects of sun exposure on 25 (OH) vitamin D concentration in urban and rural women in Malaysia. Asia Pacific journal of clinical nutrition. 2013 Jan;22(3):391-9.
20. Burgaz A, Åkesson A, Öster A, Michaëlsson K, Wolk A. Associations of diet, supplement use, and ultraviolet B radiation exposure with vitamin D status in Swedish women during winter. The American journal of clinical nutrition. 2007 Nov 1;86(5):1399-404.
21. Mullie P, Autier P. Fatty fish and the relation between 25 (OH) vitamin D and triacylglycerol. European journal of clinical nutrition. 2011 May;65(5):661-.
22. Lavado-García J, Roncero-Martin R, Moran JM, Pedrera-Canal M, Aliaga I, Leal-Hernandez O, Rico-Martin S, Canal-Macias ML. Long-chain omega-3 polyunsaturated fatty acid dietary intake is positively associated with bone mineral density in normal and osteopenic Spanish women. PloS one. 2018 Jan 5;13(1): e0190539.
23. Costenbader KH, MacFarlane LA, Lee IM, Buring JE, Mora S, Bubes V, Kotler G, Camargo Jr CA, Manson JE, Cook NR. Effects of one year of vitamin D and marine omega-3 fatty acid supplementation on biomarkers of systemic inflammation in older US adults. Clinical chemistry. 2019 Dec 1;65(12):1508-21.
24. Saraff V, Shaw N. Sunshine and vitamin D. Archives of disease in childhood. 2016 Feb 1;101(2):190-2.
25. Matsuoka LY, Wortsman J, Hanifan N, Holick MF. Chronic sunscreen uses decreases circulating concentrations of 25-hydroxyvitamin D: a preliminary study. Archives of dermatology. 1988 Dec 1;124(12):1802-4.
26. Annweiler C, Le Gall D, Fantino B, Beauchet O. Fish consumption and dementia: keep the vitamin D in memory. European Journal of Neurology. 2010 Jun;17(6): e40-.
27. Ristic-Medic D, Takic M, Pokimica B, Terzic B, Kojadinovic M, Lepic T, Radjen S, Vucic V. Dietary Omega-3 PUFA Intake in Patients with Chronic Kidney Disease: The Association with Vitamin D Deficiency, Intima–Media Thickness and Blood Pressure. Journal of Clinical Medicine. 2024 Sep 20;13(18):5593.
28. Augustine LF, Nair KM, Kulkarni B. Sun exposure as a strategy for acquiring vitamin D in developing countries of tropical region: Challenges & way forward. Indian Journal of Medical Research. 2021 Sep 1;154(3):423-32.
29. Shahid SM, Ali MN, Lina KS, Paul SR, Islam SS, Lisa T. Pediatric Laparoscopic Inguinal Hernia Repair: A Comparison between Techniques. TAJ: Journal of Teachers Association. 2020 Dec 31;33(2):20-6.
30. Hossain Z, Ali N, Shahid SM, Paul SR, Al Mamun A. Outcome of gastroschisis in Rajshahi Medical

College Hospital: Searching for the way of improvement. TAJ: Journal of Teachers Association. 2024 Jun 30;37(1):192-200.
31. Shahid SM, Ali N, Islam SS, Lina KS. Management of Posterior Urethral Valves: An Outcome Analysis of Endoscopic Valve Fulguration. TAJ: Journal of Teachers Association. 2018;31(2):68-72.
32. Das D, Shahid SM, Paul SR, Hussain Z, Nure RH, Shuvo SS. Dorsal Mesenteric Agenesis without Small Bowel Atresia: A Rare Pediatric Case Insight. TAJ: Journal of Teachers Association. 2024 Dec 31;37(2):381-4.
33. Islam SS, Hassan P, Ali MN, Shahid SM, Badruddoza SM, Ahmed M. Undescended Testes in Children: Clinicopathological Study of 32 Cases. TAJ: Journal of Teachers Association. 2017;30(2):26-31.
34. Ali MN, Hannan MA, Shahid SM, Kubba T, Roy D. Ultrasound Guided Needle Aspiration of Breast Abscess as an Alternative to Surgical Incision and Drainage. TAJ: Journal of Teachers Association. 2020 Oct 18;33(1):1-4.
35. Nowshad A, Shahid SM, Islam SS, Mostaque A. Intussusception Secondary to Isolated Heterotopic Pancreas of Meckel's Diverticulum. TAJ: Journal of Teachers Association. 2011 Jun 30;24(1):16-20.
36. Shahid SM, Ali MN, Sarkar MH, Rahman MH. Ensuring authenticity in scientific communication: Approaches to detect and deter plagiarism. TAJ: Journal of Teachers Association. 2024 Jun 30;37(1):i-ii.
37. Alam KM, Shahid SM. PCR Test for SARS-CoV-2, Rajshahi Medical College Perspective. TAJ: Journal of Teachers Association. 2024 Dec 31;37(2):1-4.
38. Haque MA, Islam MI, Hasan H. Successful Surgical Creation and Management of an Arteriovenous Fistula: A Case Report. Asia Pacific Journal of Surgical Advances. 2024 Aug 31;1(1):34-8.
39. Paul SR, Ali MN, Shahid SA, Paul SC, Haque MN, Hossain MZ. Acute Sigmoid Volvulus: Outcome of Primary Resection & Anastomosis in a Tertiary Hospital. TAJ: Journal of Teachers Association. 2022;35(2):13-8.
40. Hasan H, Rahman MH, Haque MA, Rahman MS, Ali MS, Sultana S. Nutritional management in patients with chronic kidney disease: A focus on renal diet. Asia Pacific Journal of Medical Innovations. 2024 Aug 31;1(1):34-40.
41. Shahid SM, Ali MN, Paul SR, Hossain MZ, Al Mamun A. Demographic Profile and Outcome of Paediatric Solid Tumor Patients, in a Tertiary Level Hospital in Bangladesh. TAJ: Journal of Teachers Association. 2024 Jun 30;37(1):55-62.
42. Haque MA, Begum MM, Rahman MS, Hasan H. Complications of Arteriovenous Fistula Surgery: A Comprehensive Study in Bangladesh. TAJ: Journal of Teachers Association. 2024 Dec 31;37(2):87-97.
43. Haque A, Rahman S, Roshid M, Hasan H, Uddin N. Dietary Protein and Fluid Management in CKD Patients Undergoing Arteriovenous Fistula (AVF) Surgery: Investigating the Role of Nutrition on Reducing Fistula Failure. Pacific Journal of Medical Research. 2024 Dec 31;1(1):26-34.
44. Genuis SJ, Schwalfenberg GK, Hiltz MN, Vaselenak SA. Vitamin D status of clinical practice populations at higher latitudes: analysis and applications. International Journal of Environmental Research and Public Health. 2009 Jan;6(1):151-73.

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