Association of vitamin D with Metabolic Syndrome and Status of Anthropometric parameters Among Jammu & Kashmir Women Police

1. Dr. Shahida choudhary
Post graduate student.Deptt of physiology GMC jammu.

2. Dr Mrityunjay professor
Deptt of physiology GMC jammu

3. Dr. Sunita kumari
senior resident . Deptt of physiology Gmc jammu

4. Aprajita Gupta
Post graduate student deptt of physiology GMC jammu

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Abstract: Background: In recent years, the term metabolic syndrome has gained much use in public health. Linking the risk of metabolic syndrome with Vitamin D deficiency is the result of a broad spectrum of its activities in the body through Vitamin D Receptors (VDR), involved in the pathogenesis of obesity and type-2 diabetes. The present study has been conducted to explicitly find a possible association of vitamin D level with anthropometric parameters.

Materials and methods: A total of 101 healthy female subjects from female battalion of J&K Police were included in the study. The subjects who were actively involved in law and order duties were included. Only those who volunteered to be part of our study were taken up. The study was under taken after approval by the institutional Ethical committee.

Results: Very high prevalence 55.5% (26.7-81.8) was seen in subjects with BMI > 30(obese). The proportion of overweight subjects with BMI more than 25 and less than 30 were 24.28% prevalent of metabolic syndrome. Those falling in the normal weight criteria have only 5.66% (1.9-16.6) prevalence. In our study, total number of subjects found to have central obesity (wc>88) were 40. Prevalence of MetS among subjects with central obesity was 47.5(32.94-62.5) with 19 subjects having MetS out of 40. Only one subject was having MetS out of 61 having normal WC showing prevalence 1.64 (0.29-5.72).

Conclusion: We found that anthropometric parameters were significantly associated with MetS among women who had low vitamin D levels.

Keywords: Metabolic syndrome, Vitamin D, Anthropometric parameters

Introduction

The metabolic syndrome which is essentially the constellation of metabolic disorders including abdominal obesity, insulin resistance, hypertertension dyslipidemia and impaired glucose metabolism confer increased risk of coronary heart disease and type 2 diabetes mellitus.[1-6]In recent years, the term Metabolic syndrome has gained much use in public health. Linking the risk of metabolic syndrome with Vitamin D deficiency is the result of a broad spectrum of its activities in the body through Vitamin D Receptors (VDR), involved in the pathogenesis of obesity and type 2 diabetes.[7] There are multiple studies that have reported a linkageof low vitamin D levels with some major health problems that includes chronic illness, common cancers, autoimmune diseases, cardiovascular diseases and chronic obstructive pulmonary disease (COPD).[8-11] However, such studies did not considered confounding effect of anthropometric variables. The present study has been conducted to explicitly find a possible association of vitamin D level with anthropometric parameters.

Materials and Methods:

The present study was conducted to assess the Vitamin D levels and MetS variables in female police personnel of J&K Police. It was carried out in Post Graduate Department of Physiology, Government Medical College, Jammu from 2019 to 2020. Total 101 healthy female subjects from female battalion of J&K Police were included in the study.The subjects who were actively involved in law and order duties were included. Only those who volunteered to be part of our study were taken up. The study was under taken after approval by the institutional Ethical committee

InclusionCriteria

Healthy premenopausal (25-45) year old female police personnel having minimum 2 years of active service to their credit

ExclusionCriteria

Subjects were excluded from study are:-
Pregnant;
Suffering from chronic disease;
Taking hormone replacement therapy;
Taking medication that effect Vitamin D metabolism e.g. Phenytoin;
Post-menopausal (natural or Surgical).

A SSP rank senior officer was requested to allow the female police personnel to participate in this study. After getting the written permission the aim and purpose of the study was obtained from those who volunteered to be a part of the study. They were requested to report in batches of 10 to 12 after light dinner and overnight fast. Their physical parameters were recorded and their blood samples were collected by the investigator herself.

After noting their detailed history which included their working pattern, history of any drug intake, any significant past or present illness, history of Radiation, Menstrual history, Obstetric history, methodology of tests was explained to the subjects.

Results

In this section we will present the results of the study in tabular form

Table 1: Prevalence of met-syndrome according to Vitamin D

Vit. D	No.with Met-syndrome/total no. of subjects	Prevalence (95% C I)
≥20<60 (Normal)	5/29	20.83 (13.05 – 31.57)
≤20 (Deficient)	15/72	17.24 (7.6 – 34.5)

Vitamin D deficient subjects (<20ng/mL) were 72 out of total 101. Prevalence of MetS among Vitamin D deficient was 17.24% (7.6-34.5) and 20.83% (13.05-31.57) among subjects with normal levels.

Table 2: Age wise distribution and prevalence of met-syndrome

Age (years)	No. with Met-syndrome/ total no. of subjects	Prevalence (95% C I)
21-25	0/10	0
26-30	2/19	10.52 (2.9 – 31.4)
31-35	3/34	8.82 (3.1 – 22.9)

36-40	9/25	36 (20.3 – 55.5)
41-45	6/13	46.15 (23.2 – 70.9)
Total	20/101	19.80 (13.2 – 28.6)

Total number of subjects included in the study was 101 out of which 20 fulfilled the criterion of MetS. Majority of the study population was in the age group of 31-35 years (Table-1). Maximum number of subjects with MetS was between 41-45 years (46%). The next highest prevalence was found in the age group of 36-40 years (36%). There was no case of MetS found in the age group of 21-25 years

Table 3: Prevalence of met-syndrome according to BMI

BMI	No.with Met-syndrome/total no. of subjects	Prevalence (95% C I)
<18.5	0/4	0
≥18.5<25	3/53	5.66 (1.9 – 16.6)
≥25<30	12/35	24.28 (20.83 – 50.85)
≥30	5/9	55.5 (26.7 – 81,1)

Metabolic syndrome was diagnosed according to the NCEP ATP III guidelines. Very high prevalence 55.5% (26.7-81.8) was seen in subjects with BMI > 30(obese). The proportion of overweight subjects with BMI more than 25 and less than 30 were 24.28% prevalent of metabolic syndrome. Those falling in the normal weight criteria have only 5.66% (1.9-16.6) prevalence.

Table 4: Association between BMI and Met-syndrome

BMI	With Met-syndrome	Without Met-syndrome	χ (Chi-Square)	P-value	Crude odds Ratio (95%C I)
>30	5	4	7.95	0.005	6.42 (1.54-26.71)
≤30	15	77			

Significant association was found between BMI and Metabolic Syndrome with p-value = 0.005. Total of 9 subjects were falling in class 1 category of obesity as per WHO classification, having BMI > 30 kg/m2 and out of these, 5 were falling in MetS category.

Table 5: Prevalence of met-syndrome according to central obesity (waist circumference)

Central obesity (waist circumference)	No.with Met-syndrome/ total no. of subjects	Prevalence (95% C I)
<88 (Normal)	1/61	1.64 (0.29– 5.72)
≥88 (Abnormal)	19/40	47.5 (32.94 – 62.5)

In our study, total number of subjects found to have central obesity (wc>88) were 40. Prevalence of MetS among subjects with central obesity was 47.5(32.94-62.5) with 19 subjects having MetS out of 40. Only one subject was having MetS out of 61 having normal WC showing prevalence 1.64 (0.29-5.72).

Table 6: Association between central obesity (waist circumference) and Met-syndrome

Central obesity (waist circumference)	With Met-syndrome	Without Met-syndrome	χ^2 (Chi-Square)	P-value	Crude odds Ratio (95%C I)
≥88	19	21	31.99	<0.001	54.29 (6.84-430.7)
<88	1	60			

Association between waist circumference (central obesity) and metabolic syndrome was found to be statistically very significant with p value < 0.0001.

Table 7: Association between waist hip ratio (WHR) and Met-syndrome

WHR	With Met-syndrome	Without Met-syndrome	χ^2 (Chi-Square)	P-value	Crude odds Ratio (95%C I)
≥85	19	31	20.65	<0.001	30.65 (3.91-240.5)
<85	1	50			

We observe that there is a significant association of WHR with MetS. Out of total 20 subjects with MetS, 19 were found to have WHR > 85 only one subject was having WHR <0.85

Table 8: Comparative summary of the subjects studied

Parameter	Mean value in Subjects with MetS (N=20)	Mean value in Subjects without MetS (N=81)	t-Test	P Value	95% C I of the mean difference
AGE	37.85	32.66	3.90	<0.001	2.55-7.82
DUR. OF SERVICE	15.55	9.64	4.05	<0.001	3.01-8.79
WT.	77.05	65.35	4.655	<0.001	6.71-16.7
HT	165.07	164.54	0.457	0.649	-1.74-2.79
BMI	28.26	24.17	4.525	<0.001	2.30-5.88
WAIST CIR.	93.95	81.29	5.721.	<0.001	8.27-17.4
HEP CIR.	101.60	92.96	2.991	0.004	2.91-14.37
WAIST-HEP RATIO	0.92	0.85	4.741	<0.001	0.04-0.10

We observed that there exists a significant difference between subjects with and without MetS with respect to age, duration of service, weight, BMI, waist circumference, Hip circumference and waist hip ratio

Discussion

In the present study, 101 female Police Personnel were taken up after applying exclusion and inclusion criteria. The Subjects were assessed for serum Vitamin D levels and prevalence of Metabolic Syndrome variables. In addition to this, we assessed anthropometric parameters among patients with metabolic syndrome and without metabolic syndrome. In the present work we followed NCEP ATP III guidelines for the diagnosis of MetS. The present study revealed the prevalence of MetSin) 20% of subjects under study which is consistent with a study by (Zhang et al., 2019) who reported the prevalence of 23.2 % in police officers. [12]Almost similar observations (29.5%) were seen in another study done by **(Doddapa MB et al., 2019).** Prevalence of (16.8%) lower than our findings was reported by (Thayyil et al., 2012)and (17.6%) in Brazilian navy (Costa M et al., 2011).[13, 14]In contrast to above referred studies, a higher prevalence of MetS (57.3%) in Chennai Police was reported by (**Tharkar S et al., 2008)**(62.3%) in Mumbai Police done by (**Almale BD et al., 2015)**and (64.55%) observed in study by (**Sunil BN et al., 2018)**of Kolar Police. [15-17]Results of these studies being different from ours can be attributed to the fact that they have emanated from

cities/towns having entirely different geographic and climatic conditions. In present work, no direct comparison between policemen and general population was made, but the prevalence of MetS has been found lower than that in Jammu's general population (35.24%) as estimated by study done by (Sharma et al., 2019).[18]The age of our subjects ranged from 21 to 45 years and this is comparable to study done by (Strauss M et al., 2020).[19] Our subjects were predominantly Middle aged with maximum number falling in the age group of 31 to 35 years. Our study shows significantly high prevalence (46.15%) of MetS in older age group of 41 to 45 years. Similar inference has been drawn by (Prasad D.S et al., 2012). [20]In our study the MetS rates do increase from 10 % in Age 26-30 to 46 % in age group 41-45 years supported by (Ford E et al, 2004). [21] Our study depicts that younger age group is associated with lower risk of MetS. Similar results were seen in study by (Zhang J et al., 2019).[12]Our study group comprises of pre-menopausal females which is comparable with study done by (Karolina Rogal., 2010). [22]The development of obesity or, more specifically an increase in abdominal fat, is thought to be primary event is the progression of MetS and Asian Indians have shown to have a tendency to develop obesity (Ramachandran A et al., 1992).[23]Asian Indian are Metabolically obese, but Physically non-obese (Ruderman N et al., 1998).[24]Overweight is defined as a body mass index (BMI) more than 30 Kg/m2 (WHO, 2016).The findingsfrom Third Health and National Nutritional Survey showed that the odds of having the metabolic syndrome increases with increasing levels of BMI (Park Y et al., 2003).[25]Obesity has been shown to be both an independent risk for CVD and also an indirect factor due to its involvement in hypertension, diabetes and hyperlipidemia. Prevalence of BMI among our subjects was 9%. In our study the distribution of subjects as per their BMI was 4% underweight, 53% normal, 35% overweight and 9% obese which is comparable (8% obese) to a study done by (Lenders et al., 2009).[26]In contrast, (Shabana et al., 2009)have reported very high prevalence of BMI among their subjects i.e 62.9% and 75.8% respectively.[27] It is pertinent to note that these two studies were carried out in south India which has typical tropical climate different from that of J&K. Also the dietary habits of two regions are quite different. Genetic factors being responsible for such high prevalence of obesity cannot be ruled out. Our subjects were young in age with 60% falling in the age group of 30-40 years. Moreover police personnel have to follow a strict schedule of physical exercise which can be the reason for such low prevalence of BMI in our subjects. High BMI is strongly associated with increased risk of MetS in police officers. Our study resulted in statistically significant association between MetS and BMI with p value <0.005. Prevalence of MetS among our subjects was found to be 55.5% i.e 5 subjects out of total 9 were having Mets. In our study Metabolic Syndrome was found to be 5.6%, 24.28%, 55.5% in normal weight, overweight, and obese women respectively comparable to a study done by (HyleimYoo et al., 2011).[28]Most individuals with the MetS are either overweight or obese, which suggests that obesity in conjunction with genetic aspects of susceptibility may link the components of the Metabolic Syndrome (Despres J et al., 1992).[29]In a Western study by **Ramey SL et al., (2011)** among Police officers the average BMI was 28.6 (+ 49Kg/m2) which is quite close to our study.[30] Central obesity is a key feature of MetS, reflecting the fact that the syndrome's prevalence is driven by the strong relationship between waist circumference and increasing adiposity**.** The chance of incurring health risks such as diabetes, cardiovascular diseases, hypertension, hyperlipidemia, and risk of certain cancers increases many folds in association with obesity**.** Statistically very significant correlation was found in our study as 47% among obese have metabolic syndrome with p value <0.0001. Similar association was found in study by (Yoo H et al., 2011).[28]A waist circumference >80cm was associated with higher prevalence of hypertension among police personnel according to (Ganesh KS et al., 2014). [31]Our study resulted in 39.6% prevalence of obesity based on NCEP-ATP 111 criteria (i.e. more than 88cms in females). These findings are supported by a study conducted by (Alghamdi et al., 2017).[32]In contrast, values lower than our results have been reported by(Zhang et al., 2019) and (Bannigidaal., 2019).[12,33]Other studies have reported prevalence of obesity ranging between 7-34% (Ganesh KS et al., 2014). [31]Very high prevalence of obesity was seen in studies by (Shabanaand (Tharkar et al., 2008)65%. [15,27]Such widely different observations can be due to difference in sample size, dietary habits of the subjects and genetic propensity of some population towards obesity.

Conclusion

The present study demonstrated that serum concentration of vitamin D was significantly lower among women with metabolic syndrome (75%) compared to women without metabolic syndrome (70.37%). We have also observed that in women with metabolic syndrome mild deficiency occurred much more frequently than in women without MetS. In addition to this, we found that anthropometric parameters were significantly associated with MetS among women who had low vitamin D levels.

References

5. Third report of the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III) final report. Circulation (2002) 106:3143–3421
6. Ford ES 2004 The metabolic syndrome and mortality from cardiovascular disease and all-causes: findings from the National Health and Nutrition Examination Survey II Mortality Study. Atherosclerosis 173:307–312
7. Haffner SM, Valdez RA, Hazuda HP, Mitchell BD, Morales PA, Stern MP 1992 Prospective analysis of the insulin-resistance syndrome (syndrome X).Diabetes Care 41:715–722
8. Isomaa B, Almgren P, Tuomi T, Forsen B, Lahti K, Nissen M, Taskinen MR, Groop L 2001 Cardiovascular morbidity and mortality associated with themetabolic syndrome. Diabetes Care 24:683–689
9. Lakka HM, Laaksonen DE, Lakka TA, Niskanen K, Kumpusalo E, Toumilehto J, Salonen JT 2002 The metabolic syndrome and total and cardiovasculardisease mortality in middle-aged men. JAMA 288:2709–2716
10. Trevisan M, Liu J, Bahass FB, Menotti A1998 Syndrome X and mortality: a population-based study. Risk factor and life expectancy research group. Am J Epidemiol 148:958–966
11. **Hector F Deluca and Margaret clagett-Dame**. Vitamin D. *Encyclopedia BiolChem*2007; 4: 372-76.
12. Bouillon R, Bischoff-Ferrari H, Willett W. Vitamin D and health: perspectives from mice and man. J Bone Miner Res. 2008;23(7):974–979. doi: 10.1359/ jbmr.080420.
13. Bouillon R, Carmeliet G, Verlinden L, van Etten E, Verstuyf A, Luderer HF, et al. Vitamin D and human health: lessons from vitamin D receptor null mice. Endocr Rev. 2008;29(6):726–776. doi: 10.1210/ er.200428-0004.
14. Holick MF. Vitamin D deficiency. N Engl J Med. 2007;357(3):266–281. doi: 10.1056/ NEJMra070553
15. Janssens W, Lehouck A, Carremans C, Bouillon R, Matheiu C, Decramer M, et al. Vitamin D beyond bones in chronic obstructive pulmonary disease: time to act.Am J RespirCrit Care Med. 2009;179(8):630– 636. doi: /pdf/10.1164/rccm.200810-1576PP.
16. Zhang J, Liu Q, Long S, Guo C, Tan H. Prevalence of metabolic syndrome and its risk factors among 10,348 police officers in a large city of China: A cross-sectional study. *Medicine (Baltimore).* 2019; 98(40):e17306
17. Thayyil J, Jayakrishnan TT, Raja M, Cherumanalil JM. Metabolic syndrome and other cardiovascular risk factors among police officers. *North Am J Med Sci*2012; 4: 630-35.
18. Costa FF, Montenegro VB, Lopes TJ, Costa EC. Combination of risk factors for metabolic syndrome in the military personnel of the Brazilian Navy. *Arq Bras Cardiol.* 2011; 97(6):485-92.
19. Tharkar S, Kumpatla S, Muthukumaran P, Viswanathan V. HIgh prevalence of metabolic syndrome and cardiovascular risk among police personnel compared to general population in India. 2008; 56: 845-49
20. Almale BD, Bansodegokhe SS, Suryawanshi SR. Health profile of Mumbai police personnel, a cross sectional study. *Indian Journal of Forensic and Community Medicine*. 2015; 2: 1-8.
21. Sunil B N and PrasannaKamath B T. Health profile of Kolar Police Personnel. *J Clin Biomed Sci.* 2018; 8(3): 85-92
22. Sharma R, Sharma R and Kumar A. Metabolic syndrome prevalence in Udhampur, Jammu city. *Int J Pharm Scie& Res.* 2019; 10(3): 1420-25.
23. Strauss M, Foshag P, Brzek A, Vollenberg R, Jehn U, Leischik R. Metabolic Syndrome in Female Police Officers and Female Office Workers: A Cross-Sectional Study in Occupations with Different Physical Activities. *Diabetes MetabSyndrObes.* 2020; 13: 3487-3495.
24. **Prasad DS, Kabir Z, Dash AK, Das BC**. Abdominal obesity, an independent cardiovascular risk factor in Indian subcontinent: A clinical epidemiological evidence summary. *J Cardivasc Dis Res* 2011; 2: 199-205.
25. **Ford ES, Ajani UA, McGuire LC, Liu S**. Concentrations of serum Vitamin D and the Metabolic Syndrome among U.S. adults. *Diabetes Care* 2005; 28: 1228-30.
26. **Karolina Rogal** and **AnetaMankowska**. Occurrence of Vitamin 25(OH)D3 Insufficiency in Young Women with Metabolic Syndrome. *EJIFCC.* 2011; 21(4): 101–107.
27. Ramachandra A, Snehalata C and Dharamraj D. Temporal changes in prevalence of glucose intolerance in Asian Indians-Urban rural difference and significance of upper body adiposity. *Diabetes care* .1992; 15(10): 1348-1355.
28. Ruderman N, Chisholm D, Pi-Sunyer X, Schneider S. The metabolically obese, normal-weight individual revisited. *Diabetes.* 1998; 47(5): 699-713.
29. Park YW, Zhu S, Palaniappan L, Heshka S, Carnethon MR, Heymsfield SB. The metabolic syndrome: prevalence and associated risk factor findings in the US population from the Third National Health and Nutrition Examination Survey, 1988-1994. *Arch Intern Med.* 2003;163(4):427-36.

30. **Lenders CM, Feldman HA, Von Scheven E**. Relation of body fat indexes to vitamin D status and deficiency among obese adolescents. *Am J ClinNutr*2009; 90: 459-67.
31. Shabana T, Vijay V. Impact of socioeconomic status on prevalence of overweight and obesity among children and adolescents in urban India. The Open Obesity Journal. 2009;1:9-14
32. Hyelim Y. Assessment of contributors to the metabolic syndrome among law enforcement officers (2011) https://doi.org/10.31274/etd-180810-1962
33. Després JP, Moorjani S, Lupien PJ, Tremblay A, Nadeau A, Bouchard C. Genetic aspects of susceptibility to obesity and related dyslipidemias. *Mol Cell Biochem.* 1992;1 13(2):151-69.
34. Ramey SL, Perkhounkova Y, Downing NR, Culp KR. Relationship of cardiovascular disease to stress and vital exhaustion in an urban, midwestern police department. *AAOHN J.* 2011; 59(5):221-27.
35. Ganesh KS, Naresh AG, Bammigatti C. Prevalence and Risk Factors of Hypertension Among Male Police Personnel in Urban Puducherry, India. Kathmandu *Univ Med J (KUMJ).* 2014;12(48):242-46.
36. Alghamdi AS, Yahya MA, Alshammari GM, Osman MA. Prevalence of overweight and obesity among police officers in Riyadh City and risk factors for cardiovascular disease. Lipids Health Dis. 2017 Apr 14;16(1):79. doi: 10.1186/s12944-017-0467-9. PMID: 28410598; PMCID: PMC5391546.
37. Bannigida DM, Nayak SB. Coronary Risk Factors and Oxidative Stress in Women with PCOS. Indian J Med Biochem 2019; 23 (2):267-269.10.5005/jp-journals-10054-010