

Prevalence of metabolic disorders among women in reproductive age group in hilly rural area of North India

Jai G. Vohra¹, Abhishek Pathania¹, Piyush Vohra², Gurmeet Singh¹,
Kiranjeet Kaur³

¹Department of Community Medicine, Maharshi Markandeshwar Medical College and Hospital, Solan, Himachal Pradesh, India, ²Department of Obstetrics and Gynaecology, Indira Gandhi Medical College, Shimla, Himachal Pradesh, India, ³Department of Biochemistry, Maharshi Markandeshwar Medical College and Hospital, Solan, Himachal Pradesh, India

ABSTRACT

Background: Metabolic syndrome consists of cardiometabolic risk factors that promote the development of atherosclerotic cardiovascular disease, type 2 'DM' and obesity. These are associated with increased cardiovascular mortality and morbidity. Metabolic disorders (MD) are becoming more prevalent both in developing countries and developed countries and are now considered as lifestyle diseases. In women of reproductive age group, especially pregnancy, the blood glucose level is increasing which adversely affects the health of mother and child. Similarly, high blood pressure also precipitates the problems. This study was carried out to find the prevalence of hypertension, diabetes mellitus, obesity and 'MD' among the women living in remote rural set-up. **Materials and Methods:** This cross-sectional study was done among women of reproductive age group in 15 villages from 5 panchayats of field practice area of Maharshi Markandeshwar Medical College and Hospital, Kumarhatti, Solan. They were screened for 'MD' through investigative procedures (weight, height, BMR, abdominal girth, blood pressure through sphygmomanometer, blood glucose through the glucometer method), serum HDL and triglycerides. Respondents from the family were asked about the common/general information of house. The tool used for collecting general and relevant information from the respondent was a questionnaire, which was pretested for validity before being used in the field. **Results:** Four-hundred and sixty-seven women of reproductive age group participated in the study. Half of the participants were with qualification of matriculate and 9.2% participants were illiterate. Three-fourths of the participants were married women and 89% were vegetarian. Sixty-four per cent of participants were housewives. Half of the participants had a normal BMI, whereas 28.9% were overweight and 10% were obese. The prevalence of hypertension and diabetes among the participants were 12.5% and 9.8%, respectively. Forty-seven per cent participants had a waist circumference above 80 cm. **Conclusion:** The level of non-communicable diseases is related with the MD which has the adverse effect on the various systems and organs of the subjects. The MD can be controlled with the certain changes in the life style pattern. The GOI is also concerned with such scenarios in the country. It is recommended that women of reproductive age group undergo regular blood pressure and blood sugar screenings to detect hypertension and diabetes early and take appropriate measures to manage them.

Keywords: Abdominal circumference, blood glucose, BMI, diabetes, hypertension, metabolic disorder, overweight, reproductive

Introduction

Metabolic disorders (MD) are established risk factors for coronary artery disease and premature death.^[1,2] Lifestyle changes, obesity and other metabolic factors are responsible for sclerotic changes in blood vessels and often implicated in causation

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Vohra JG, Pathania A, Vohra P, Singh G, Kaur K. Prevalence of metabolic disorders among women in reproductive age group in hilly rural area of North India. J Family Med Prim Care 2024;13:579-84.

Address for correspondence: Dr. Jai G. Vohra,
Department of Community Medicine, Maharshi
Markandeshwar Medical College and Hospital, Solan - 173229,
Himachal Pradesh, India.
E-mail: vohra05@gmail.com

Received: 16-04-2023

Revised: 05-07-2023

Accepted: 07-07-2023

Published: 06-03-2024

Access this article online

Quick Response Code:



Website:
<http://journals.lww.com/JFMPC>

DOI:
10.4103/jfmpe.jfmpe_656_23

of coronary artery disease.^[3,4] These pathological changes are associated with increased mortality and morbidity. There are several definitions of metabolic syndrome (MS) given by different bodies and the risk of cardiovascular event differs according to the presence of associated factors. As per the definition from Joint Interim Statement of the International Diabetes Federation Task Force on Epidemiology and Prevention, National Heart Lung and Blood Institute, American Heart Association, World Heart Federation, International Atherosclerosis Society and International Association for the Study of Obesity and Consensus Statement for Diagnosis of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asian Indians, three out of five cardiovascular risk factors are essential for clinical diagnosis of the MS.^[5]

1. Increased waist circumference (males: ≥ 90 cm and females: ≥ 80 cm)
2. Hypertriglyceridemia ≥ 150 mg/dl (1.7 mmol/l)
3. Low-high density lipo-protein (males < 40 mg/dl [1 mmol/l] and females < 50 mg/dl [1.3 mmol/l])
4. Elevated blood pressure (systolic blood pressure ≥ 130 mmHg and/or diastolic blood pressure ≥ 85 mmHg or drug treatment for hypertension)
5. Elevated blood sugar (fasting blood sugar ≥ 100 mg/dl [5.6 mmol/l] or drug treatment for diabetes mellitus).

The prevalence of obesity and MS is rapidly increasing in India and other South Asian countries, leading to increased mortality and morbidity due to cardiovascular disease and type 2 DM.^[6-9] The prevalence of 'MS' is influenced by genetic background, age, sex, diet and levels of physical activity. There is an increased prevalence of 'MS' in India and other South Asian countries due to lifestyle and socioeconomic transitions as a result of increased affluence, urbanization, mechanization and rural-to-urban migration.^[10-13]

National Family Health Survey-4 report 2016 by Govt. of India, Ministry of Health and Family Welfare, State Fact Sheet Himachal Pradesh,^[14] showed that the prevalence of blood sugar above 140 mg/dl in women of the reproductive age group of rural area is 5.7% and that above 160 mg/dl of blood is 2.9%. The prevalence figures of blood pressure were 9.3% (slightly above normal systolic 140–159 mm of mercury and diastolic and/or 90–99 mm of mercury), 1.7% (moderately high systolic 160–179 mm of mercury and diastolic and/or 100–109 mm of mercury) and 0.9% (very high systolic above 180 mm of mercury and diastolic and/or ≥ 110 mm of mercury). In the same survey, 27.6% women of the reproductive age group in the rural Himachal were either overweight or obese with the body mass index (BMI ≥ 25 kg/m²).^[14]

Women of the reproductive age group constitute about 53% of female population in the state of Himachal Pradesh as per the National Family Health Survey-5 report 2021.^[15] The women in this age group are common clientele of primary care physicians as they provide maternal health, child health and family planning services to them. With this research, we try to draw attention

of primary care physicians, family physicians and policy makers towards other healthcare needs of women in the reproductive age group. No community-based study has been conducted among women of the reproductive age group residing in this part of the state; hence, an attempt was made to find out the prevalence of the MD and the likely associated factors. This will help in guiding policy decisions and further research on this topic.

Aims and Objectives

This research was conducted with the following objectives:

- (1) To measure the prevalence of MD in the reproductive age-group women in rural field practice area of Maharishi Markandeshwar Medical College of Solan district of HP.
- (2) To identify and assess contributory causes of MD in reproductive age-group women of rural field practice area of Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan.

Materials and Methods

This study is a descriptive cross-sectional field study conducted for assessing the prevalence of MD in the reproductive age-group women in remote rural catchment areas of rural health training centre (RHTC), Joharji, in the hilly region of Himachal Pradesh. By using simple random sampling, 5 gram panchayats were selected and 15 villages out of them were taken for the study. All women in the reproductive age group residing in these villages were then approached for participation in this study. Four-hundred and sixty-seven women of 15–45 years of age consented to participate in the study.

While paying house-to-house visit, investigators used a predesigned, pretested, semi-structured interview schedule as a tool to collect the information from the respondents. Women in the age group of 15–45 years (fertile age group), who were permanent residents of the locality (residing for more than 6 months) and who were willing to participate in the study, were included in the study. A formal written informed consent was taken from the participants who were willing to participate in the study. Temporary visitors/guests/person residing in the area for less than 6 months, persons not interested/willing to participate in the study, and women suffering from a severe ailment were excluded from the study. After inclusion criteria were fulfilled, written informed consent was obtained from all women before recruitment for this study. A detailed history regarding age, socioeconomic status, occupation status, literacy status, smoking, alcohol intake, nutritive habits, reproductive profile, personal profile and health profiles was elicited. Weight and height were taken with a standard procedure. Waist circumference was measured at the point halfway between the lower border of ribs and the iliac crest in a horizontal plane. Initially, it was planned to take the blood samples for lipid profile (serum triglyceride and HDL cholesterol) of participants; it could not be done to constraints posed by the COVID-19 pandemic.

Data collected were entered into Microsoft Excel sheet on daily basis. Data analysis was done using SPSS Software (version 20.0). Appropriate tables and figures were used to present the data summary.

Results

In this study, 467 women in the reproductive age group participated. The distribution of participants according to educational status is shown in Figure 1. More than half of the study participants had passed their high school certificate examination, though 43 study participants could not read or write in any language (illiterate). The distribution of participants by their place of residence (village) is shown in Figure 2. The difference in population of villages can be appreciated from Figure 2. Table 1 shows the age distribution of participants, wherein two-thirds of the study participants were below 40 years of age and one-third of the participants were in the age group of 40–45 years. Eight women were found to be pregnant which makes a percentage of 1.7. Pregnancy wastage was found to be in 31 subjects which make a percentage of 6.6.

This study was conducted in a hilly rural community of Himachal Pradesh where agricultural activities are the main occupation of people. Two-thirds of the study participants were homemakers and worked in the fields for most time of the year. Around 20% of the participants were pursuing their studies. The rest of the participants around 10% were in occupations like Aanganwadi, teaching and shopkeeping.

Table 2 shows the distribution of participants according to their BMI. It may be noted that half of the study participants were in the normal BMI range, while 10% of the study participants were underweight. Around 29% of the participants were overweight and the remaining 10% were obese according to their BMI. Table 3 shows the means and standard deviations of quantitative variables, namely, systolic and diastolic blood pressure, blood glucose (random), and abdominal circumference.

Table 4 shows the distribution of four risk factors for MS studied. Fourteen participants reported of being diagnosed with hypertension in the past and five out of these were taking anti-hypertensive treatment. The overall prevalence of hypertension was slightly higher at 12.5% compared to 9.8% for diabetes mellitus. Obesity as per BMI was present in 10.3% participants, while 28.9% were overweight. Use of tobacco and alcohol are established risk factors for hypertension. Around 47% participants had a waist circumference of more than 80 cm. In this study, none of the participants reported use of tobacco or consumption of alcohol ever in their lifetime.

Discussion

This cross-sectional study with a representative sample size was conducted among women of the reproductive age group in a hilly region of North India which has a unique environment and

Table 1: Age-wise distribution of participants

Age group (years)	Number of women	Percentage of study population
15–19	66	14.1
20–29	132	28.3
30–39	102	21.8
40–45	167	35.8
Total	467	100.0

Table 2: Distribution of participants according to BMI

Body mass index	Number of participants	Percentage of study population
18.5 or less (underweight)	49	10.5
18.6–24.99 (normal)	235	50.3
25–29.99 (overweight)	135	28.9
30–34.99 (obesity class 1)	38	8.1
35–39.99 (obesity class 2)	8	1.7
40 and above (morbid obese)	2	0.4
Total	467	100.0

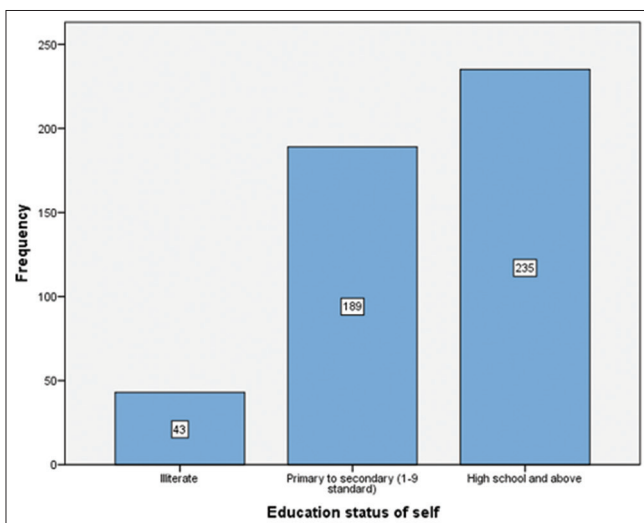


Figure 1: Distribution of women according to educational status

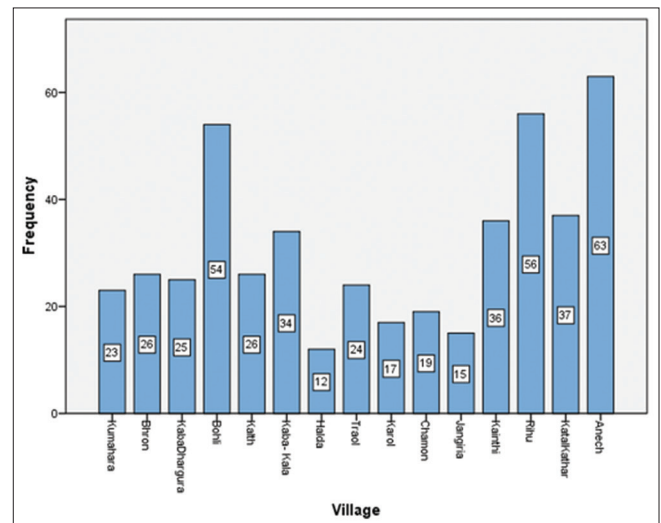


Figure 2: Distribution of participants according to village

Table 3: Mean and standard deviation of measures

Value	SBP (mmHg)	DBP (mmHg)	Repeat SBP (mmHg)	Repeat DBP (mmHg)	Random blood glucose (mg/dl)	Abdominal circumference (cm)
Mean	115.31	74.00	126.26	80.04	109.15	79.02
SD	12.429	8.539	11.254	7.519	18.793	10.794

Table 4: Metabolic risk factors among study participants

Diabetes	Fasting blood glucose 126 mg/dl or above	Self-reported and on treatment	Total prevalence	
	42 (9.0%)	4 (0.8%)	46 (9.8%)	
Hypertension	Systolic BP 140 mg or above OR diastolic BP 90 mg or above	Self-reported and on treatment	Total prevalence	
	45 (9.6%)	14 (2.9%)	59 (12.5%)	
Waist circumference	80 cm or above			
	220 (47.1%)			
BMI	<18.5 Underweight	18.5–24.99 Normal	25–29.99 Overweight	30 and above obesity
	10.5%	50.3%	28.9%	10.3%

culture. Majority of the participants were young adult women and it was found that around 12.5% of them had hypertension and 9.8% had diabetes mellitus. Almost half of the participants were having waist circumference more than 80 cm, which is an important risk predictor for the development of MS. Studies have been conducted in India which tell us about the prevalence of MS and its risk factors, but we could not find any among women of the reproductive age group.

According to a study published in the *Journal of Family Medicine and Primary Care* in 2018, the prevalence of hypertension among women of the reproductive age group in India is estimated to be around 10.3%. However, the prevalence may vary depending on various factors such as age, socioeconomic status, lifestyle factors and geographic location. A meta-analysis done by Krishnamoorthy Y *et al.*^[10] in the year 2020 shows that prevalence of MS among adults in India was 30%. They also found out that the prevalence of MS increases with age and it is more common among people living in urban areas than rural areas. Women had a higher prevalence (35%) as compared to men (26%). Bhimarasetty MD *et al.*^[16] analysed the results of the National Family Health Survey (2015–2016) from a nationally representative sample of 687,320 women between the age group of 15 and 49 years. They reported a prevalence of 11.3% for hypertension and that the prevalence increased with age. The results of our study are similar to the prevalence of hypertension from the NFHS data.

Prevalence of diabetes among women in the reproductive age group in the North Eastern states of India was studied by WB Meitei *et al.*^[17] They studied the data of NFHS-4 and reported a prevalence of 1.78–4.40% among different North Eastern states. In the state of Himachal Pradesh as per NFHS-4, 27.6% of women in the rural area are either overweight or obese, whereas in our study the corresponding figure is 39.3% which is on higher side. This is comparable to the results of NFHS-5 for Himachal Pradesh, wherein 38.3% of 15–49-year-old women in

rural areas have been found to be overweight or obese. Another important finding of the NFHS-5 report is the high prevalence of anaemia (51.6%) in 15–49-year-old women in rural areas.^[18] The prevalence of diabetes among women in India was 24.4 per 1000, showing variations across different geographic regions.^[19] Another study done by Anjana *et al.* in 2018 reported a prevalence of diabetes among reproductive age-group women to be 4.6%.^[20] In rural areas of Himachal Pradesh, as per NFHS-4, the proportion of fasting blood sugar level above 140 mg/dl was 5.7% and above 160 mg/dl was 2.9% which make an aggregate of 8.6%. The prevalence of diabetes among participants in our study is close to 9.8%, which is exceeding the prevalence in studies of our country but slightly higher as far as state figures are concerned for women in rural areas. This may be attributed to higher BMI of participants in our study.

When we compare the BMI of participants of our study with that of a nationally representative sample of NFHS-4 analysed by Kumar *et al.*^[21] it is seen that the proportion of overweight and obese in our study is close to 40% compared to 25% in NFHS-4, though the age range is 15–49 years in their analysis and 15–44 years in our study. The proportion of underweight came out to be lower in our study at 10% compared to 19% in NFHS-4 data analysis by Kumar *et al.* Chaudhary M and Sharma P^[22] have analysed the abdominal obesity data in NFHS-5 and their results show a high prevalence of abdominal obesity in women at 40% compared to men at 12%. They have used abdominal circumference and BMI to make a diagnosis of obesity. In our study, 47% of the participants in the age group 15–45 have abdominal circumference above 80 cm, while in the data analysed by Chaudhry and Sharma, around 40% of the population have a waist circumference above 80 cm. Here, it can be concluded that compared to the double burden of underweight and obesity in nationally representative sample, study participants in our research are more prone to face the consequences of overweight and obesity.

The results of our study show that it is time to emphasize on prevention and control of non-communicable diseases (risk factors of MS) among women in the reproductive age group. The scope for integration of family planning services, maternal and child healthcare services and prevention of communicable diseases may be ascertained through guided research.

Conclusion

It can be concluded that the prevalence of hypertension among the study population is similar to the prevalence of hypertension among the women of the reproductive age group living in other parts of the country and the national average. The prevalence of diabetes among the study participants is around double of the prevalence in other parts of the country and the national average. Diabetes and hypertension are important predictors for the risk of MS and the high prevalence of these warrants immediate focus of health agencies for their prevention and treatment. Overall, the prevalence of MS and its risk factors have been found to be increasing worldwide and it has been attributed largely to the change in lifestyle, particularly the change in eating habits.

Recommendations

The Government of India is concerned about the increased prevalence of non-communicable diseases and is working for the prevention and control of these diseases. The MD form an important part of non-communicable diseases. The problem is compounded in reproductive age-group women since they are susceptible to ill health because of some physiological and socio-economic factors. Through this study, we were able to assess the prevalence of the disease in this vulnerable age group along with the factors responsible for the MD. In the medical curriculum, we can focus on these aspects of the health issues in the women during their productive life years. It is recommended that women of the reproductive age group undergo regular blood pressure and blood sugar screenings to detect hypertension and diabetes early and take appropriate measures to manage them. Additionally, maintaining a healthy lifestyle, including a balanced diet, regular exercise, and stress management, can also help prevent MS and its risk factors. The National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke needs to have some focus on management (prevention and cure) of MD in far-to-reach areas and populations. Looking at the implications of these risk factors and the prevalence of the disease in this important section of the society, we need to focus on this aspect in undergraduate courses of M.B.B.S. and B.Sc. Nursing so that we have trained health manpower in place.

Limitations of the study

There are two main limitations of this study. The study is focused on the field practice area of Maharishi Markandeshwar Medical College and Hospital; it may not be a complete representation of the State of Himachal Pradesh which is not homogenous in terms of environmental and social factors. Serum triglyceride

levels are an important component to make the diagnosis of metabolic disorder. Due to COVID-19 pandemic, participants could not be assessed for their triglyceride levels.

Author's contribution

JGV: Conception and design, acquisition of data, analysis and interpretation of data, drafting the article and revising it critically for important intellectual content, final approval for the version to be published.

PV: Drafting article or revising it critically for important intellectual content, final approval of the version to be published.

AP: Analysis of data and interpretation of data, drafting article or revising it critically for important intellectual content, final approval of the version to be published.

GS: Conception and design, acquisition of data, analysis of data and interpretation of data, drafting article or revising it critically for important intellectual content, final approval of the version to be published.

Acknowledgement

We are thankful to the study participants, the field and supportive staff of RHTC Joharji, principal and management of the Maharishi Markandeshwar Medical College and Hospital.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Galassi A, Reynolds K, He J. Metabolic syndrome and risk of cardiovascular disease: A meta-analysis. *Am J Med* 2006;119:812-9.
2. Fahed G, Aoun L, Bou Zerdan M, Allam S, Bou Zerdan M, Bouferraa Y, *et al.* Metabolic syndrome: Updates on pathophysiology and management in 2021. *Int J Mol Sci* 2022;23:786.
3. Paynter NP, Kiefe CI, Lewis CE, Loria CM, Goff DC, Lloyd-Jones DM. Accumulation of metabolic cardiovascular risk factors in black and white young adults over 20 years. *J Am Heart Assoc* 2015;4:e000940.
4. Powell-Wiley TM, Poirier P, Burke LE, Després JP, Gordon-Larsen P, Lavie CJ, *et al.* Obesity and cardiovascular disease: A scientific statement from the American heart association. *Circulation* 2021;143:e984-1010.
5. Alberti KG, Eckel RH, Grundy SM, Zimmet PZ, Cleeman JI, Donato KA, *et al.* Harmonizing the metabolic syndrome: A joint interim statement of the international diabetes federation task force on epidemiology and prevention; National heart, lung, and blood institute; American Heart Association; World Heart Federation; international atherosclerosis society; and international association for the study of obesity. *Circulation* 2009;120:1640-5.

6. Bhalwar R. Metabolic syndrome: The Indian public health perspective. *Med J Armed Forces India* 2020;76:8-16.
7. Ranasinghe P, Mathangasinghe Y, Jayawardena R, Hills AP, Misra A. Prevalence and trends of metabolic syndrome among adults in the Asia-pacific region: A systematic review. *BMC Public Health* 2017;17:101.
8. Herningtyas EH, Ng TS. Prevalence and distribution of metabolic syndrome and its components among provinces and ethnic groups in Indonesia. *BMC Public Health* 2019;19:377.
9. Mahadevan M, Bose M, Gawron KM, Blumberg R. Metabolic syndrome and chronic disease risk in South Asian immigrants: A review of prevalence, factors, and interventions. *Healthcare (Basel)* 2023;11:720.
10. Krishnamoorthy Y, Rajaa S, Murali S, Rehman T, Sahoo J, Kar SS. Prevalence of metabolic syndrome among adult population in India: A systematic review and meta-analysis. *PLoS One* 2020;15:e0240971.
11. Ramesh S, Abraham RA, Sarna A, Sachdev HS, Porwal A, Khan N, *et al.* Prevalence of metabolic syndrome among adolescents in India: A population-based study. *BMC Endocr Disord* 2022;22:258.
12. Venugopal V, Dongre AR, Saravanan S. Prevalence and determinants of metabolic syndrome among the rural adult population of Puducherry. *Indian J Community Med* 2019;44:21-5.
13. Meher T, Sahoo H. The epidemiological profile of metabolic syndrome in Indian population: A comparative study between men and women. *Clin Epidemiol Glob Health* 2020;8:1047-52
14. National Family Health Survey (NFHS-4), 2015-16: India. International Institute for Population Sciences (IIPS) and ICF; 2017.Mumbai: IIPS.
15. National Family Health Survey (NFHS-5), India, 2019-21: Himachal Pradesh. International Institute for Population Sciences (IIPS) and ICF.2021.Mumbai: IIPS
16. Bhimarasetty MD, Pamarthi K, Prasad Kandipudi KL, Padmasri Y, Nagaraja SB, Khanna P, *et al.* Hypertension among women in reproductive age in India: Can we predict the risk? An analysis from national family health survey (2015-2016). *J Family Med Prim Care* 2022;11:5857-64.
17. Meitei WB, Singh SR. Prevalence and determinants of diabetes among women of reproductive age in northeast India. *Demography India*2021;50:55-64.
18. National Family Health Survey 5: Fact Sheet Himachal Pradesh. Indian Institute of Population Sciences; 2020. Mumbai: IIPS
19. Puri P, Shil A, Shetty A, Dhar B, Singh SK, Pati S, *et al.* Contribution of modifiable risk factors on the burden of diabetes among women in reproductive age-group in India: a population based cross-sectional study. *J Public Health Policy* 2022;43:89-108.
20. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, *et al.* Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: Phase I results of the Indian council of medical research-India DIABetes (ICMR-INDIAB) study. *Diabetologia* 2011;54:3022-7.
21. Kumar P, Mangla S, Kundu S. Inequalities in overweight and obesity among reproductive age group women in India: Evidence from national family health survey (2015-16). *BMC Womens Health* 2022;22:205.
22. Chaudhary M, Sharma P. Abdominal obesity in India: Analysis of the national family health survey-5 (2019–2021) data. *Lancet reg health - Southeast Asia*. 2023. Available from: [https://www.thelancet.com/journals/lansea/article/PIIS2772-3682\(23\)00068-9/fulltext](https://www.thelancet.com/journals/lansea/article/PIIS2772-3682(23)00068-9/fulltext). [Last accessed on 2023 Jul 5].