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REVIEW ARTICLE

Risk Factors for Chronic Diseases among Adult Women – A Systematic Review

***Madhurima.D, *Helen Shaji, **M.Hemamalini**,
Sri Balaji Vidyapeeth (Deemed to be University), Puducherry
E.mail: madhurimagopinath20@gmail.com
Professor cum Principal, Shri Sathya Sai College of Nursing, Sri Balaji Vidyapeeth (Deemed to be University), Puducherry
E helenshaji@gmail.com , Orchid id : 0003-3006-2029
**Principal, Hindu Mission College of Nursing, The Tamil Nadu Dr.MGR Medical University, TN
E.mail:hemasrini197963@gmail.com

ABSTRACT

Non Communicable Diseases are the biggest threat to the women's health responsible for 18 million deaths in women globally every year. The overall prevalence of at least one non-communicable disease was found to be higher among women as compared to men who belong to the age bracket of 35 years and above. The modifiable risk factors are unhealthy diet, physical inactivity and tobacco use. Similarly the metabolic risk factors include the increased glucose, lipids and obesity. The impact of NCD's and their risk factors include premature death, disability and suffering, low productivity, and higher household expenditures. A sustained literature search has been made to describe the prevalence of risk factors for non communicable diseases like diabetes, hypertension and cardiovascular diseases among women globally. A constant electronic search was made on the aspects of risk factors of chronic diseases. Out of which, 16 related literature had been analysed in detail. The data reviewed has been extracted in to the excel sheet and further scrutinized in depth. Factors like tobacco, smoking, poor dietary habits, physical inactivity, obesity, increased blood pressure, increased cholesterol and triglycerides were found to be associated with the incidence of non communicable diseases like type 2 diabetes, hypertension, and cardio vascular diseases in the studies reviewed.

Keywords: Risk factors, Noncommunicbale diseases, Chronic diseases, Women, Behavioural risk factors, Metabolic risk factors, Obesity, Dietary factors.

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INTRODUCTION

Non communicable diseases are the leading burden on global health. They account for 41 million deaths equivalent to 71% of all deaths globally. Two in every death among women each year are due to noncommunicable diseases. NCD's in women have been the most highlighted on various programmes and policies as 25% of premature deaths can be reduced by 2025 (1). Non Communicable Diseases in India have become a major public health problem accounting for 62% of the total burden of DALYs and 53% of total deaths every year (2).The four major non communicable diseases causing mortality in India includes cardiovascular diseases, chronic respiratory disease, cancers and diabetes, contributing to about 82% of all NCD deaths (3). NCD burden in India increased from 33% to 55% of which diabetes and hypertension dominates the total disease burden of the country (4). Non Communicable Diseases are the biggest threat to the women's health responsible for 18 million deaths in women globally every year. Diabetes is the seventh leading cause of death in women globally. Of the 2.1 million women who die each year as a result of diabetes, a large proportion is in their most productive years (40-60 years). It is expected that there will be a rise of diabetic cases in women to 222 million by the year 2030(5). In India, the prevalence non-communicable disease was found to be higher among the female as compared to male. (6,7) . One in every

three adult Indian are with hypertension of which in percentage to describe it says that 23.7% of women and 30% of men were diagnosed with high blood pressure of range ≥140/90 mm of Hg (8)
The overall prevalence of at least one non-communicable disease was found to be higher among women as compared to men who belong to the age bracket of 35 years and above, and living in the Southern part of India having the habits like consuming alcohol, smoking, and chewing tobacco(9)
The risk factors of non communicable diseases are classified as modifiable and metabolic risk factors. The modifiable risk factors are unhealthy diet, physical inactivity and tobacco use. Similarly the metabolic risk factors include the increased glucose, lipids and obesity. The impact of NCD's and their risk factors includes premature death, disability and suffering, low productivity, and higher household expenditures (10). More than 80% of heart diseases, stroke, hypertension and type 2 diabetes, and over a third of cancers can be prevented by eradicating the common risk factors, mainly tobacco use, unhealthy diets, physical inactivity, and the harmful use of alcohol (11). A sustained literature search has been made to describe the prevalence of risk factors for non communicable diseases like diabetes, hypertension and cardiovascular diseases among women globally.
The first objective of the work is to sum up on the prevalence of risk factors associated with chronic diseases like diabetes, hypertension and cardiovascular diseases among adult women. Secondly to derive the risk factors under the modifiable and metabolic risk categories prevailing among women. This is one of the focused searches towards obtaining in depth knowledge on the prevailing risk factors among adult women for the mentioned non communicable diseases.

METHODS

Search Strategy

Various search engines like pubmed , Cochrane library, scopus, google scholar have been browsed in search of abstract or full text articles related to our objective of the work. Printed international and national journals have also been read to find the related articles. In the online search engines the key words used to search were limited to risk factors of non communicable diseases, risk factors for chronic diseases, risk factors for diabetes, hypertension in women, risk factors for cardiovascular diseases among women, metabolic risk factors, modifiable risk factors, behavioural risk factors, lifestyle risk factors for women, dietary risk factors among women and non communicable diseases among women.

Inclusion and Exclusion Criteria

We included original research articles published in peer reviewed journals till 2022. Quantitative research studies done on the risk factors among women for non communicable diseases like diabetes, hypertension and cardio vascular diseases were included. Articles related to the metabolic, modifiable risk factors of mentioned chronic diseases were included from the electronic search, manual search from the printed articles, repositories and from the open access thesis database. Risk factors like behavioural factors like tobacco usage and alcohol habits, dietary habits like decreased fruit consumption, decreased vegetable consumption, increased salt consumption, decreased physical activity, obesity, abdominal obesity, pre diabetic stage, pre hypertensive stage, increased total cholesterol level, and increased stress among women were included
Articles related to the risk factors associated with breast cancer, cervical cancer and other cancers in women were excluded. Reviewed articles related to chronic disease risk factors and factors associated with gestational diabetes mellitus were not included in our work. Risk factors determining COPD and other respiratory diseases were excluded. Qualitative studies related to the determining risk factors of chronic diseases were also excluded from the search. Global and national surveys related to the risk factors of non communicable diseases were also excluded.

Selection strategy

Two reviewers were involved in the sustained literature search based on the selection criteria framed in prior to the work. The articles were reviewed on the basis of abstracts; on fitting into the inclusion criteria full text article was downloaded and studied further. Discrepancies were discussed further with the third reviewer and on resolving the discrepancy; the article was included or excluded from the review.

Data extraction and quality assessment

First reviewer extracted the data independently from the appropriate studies. The extracted data was customized in to the data extraction form in an Excel sheet, categorized under type, place and year of study, study population, sample size and the results. Risk of bias analysis was done and specified in the customized table. The extracted data was analyzed by the second reviewer and double checked by the third reviewer. The entire work of the reviewer was cross checked with the pre existing PRISMA guidelines checklist.(12)

RESULTS

We have extracted about 2985 related abstracts favoring the related search. 2900 articles were found in the electronic search and 85 in the manual search. About 2830 abstracts were excluded for not meeting the inclusion criteria, which also includes duplication in the various search engines. 155 studies were screened for full text article and searched further relativeness of which 55 articles assessed for eligibility. 15 studies were included in the in-depth literature analyses. The systematic literature search process was described in the fig 1.

6 out of the 15 article studied closely have detailed regarding the behavioral risk factors among women, 4 Out of the 15 article studied have showed regarding the bio physical risk factors like obesity and increased blood pressure prevailing among women., 3 studies have drawn on the combined factors like behavioural, and biophysical factors associated with the specified chronic diseases among women. 2 studies have described regarding the metabolic factors like increased cholesterol and triglycerides as a factor prevailing among women which were related to the cardiovascular diseases.

Behavioral risk factors

With regard to behavioral factors, tobacco and smoking habits was considered as the important factor for hypertension and cardio vascular diseases.3 studies have a mention on the prevailing tobacco and smoking habits among women. Decreased physical activity was mentioned as the second factor in one study. Two studies have reported on the dietary factors as the risk for the prevalence of hypertension and diabetes among women. Most of the studies have been adjusted with the odds ratio and hence there is a less chance of bias. One of the studies has a mention on the non adherence to life style practices was associated with the prevalence of type 2 diabetes and cardio vascular diseases.

Behavioural factors like smoking and tobacco habits were considered as the important risk factor. **Vivek K Mishra** has reported that the population attributable risk of having NCDs was 1.8% ($p < 0.001$) for women who smoked, 0.8% ($p < 0.001$) for women who consumed smokeless tobacco and 2.2% ($p < 0.001$) for women who consumed alcohol (13) **Biplab K Datta** also concluded that the odds of having uncontrolled hypertension for the tobacco user women in India was 1.1 (95% CI: 1.01–1.19) times that of tobacco non-users at prime childbearing age. The odds were also higher for tobacco-users who were overweight (1.88, 95% CI: 1.57–2.29) or obese (2.82, 95% CI: 1.88–4.24)(14) One of the prospective cohort study and a study done in Boston had concluded that unhealthy lifestyle factor with type 2 diabetes, the hazard ratio was 2.83 (2.15 to 3.73) with a significant additive interaction (P for interaction <0.001). The proportions of the joint association were 71.2% (66.9% to 75.8%) for unhealthy lifestyle alone (15, 18) A longitudinal survey among adult women had showed that low levels of physical activity (compared to those with moderate or high levels) were 1-54 times more likely to report type 2 diabetes (95%CI 1.33, 1.79; $P<0.001$)(16) A Brazilian survey among women college students compiled that Women with less than a college education were more likely to report physical inactivity (adjusted relative risk (aRR) and 95% confidence interval = 1.1 (1.1–1.2)), smoking (aRR = 1.7 (1.3–2.2)), and selfreported diagnoses of hypertension (aRR=2.0 (1.6–2.5)) compared to women with a college education or greater(17)

Overweight and obesity

Four studies have a mention on the overweight and obesity was closely associated with the prevalence of chronic diseases. One of the studies has concluded that increased waist circumference which is considered as the central obesity is also associated with the increased blood pressure. There is also a mention on two studies that the increased blood pressure is associated with the prevalence of type 2 diabetes.

Many factors may associate with overweight/obesity and in turn obesity is the major risk factor for non communicable diseases. The prevalence of hypertension was associated with obesity in many studies reviewed. A study done in north eastern part of China among adult women showed that overweight (OR = 1.97, 95% CI: 1.72–2.25), obesity (OR = 2.97, 95% CI: 2.30–3.84), diabetes mellitus (OR = 2.13, 95% CI: 1.73–2.62), high triglycerides (OR = 1.41, 95% CI: 1.20–1.65), and history of cardiovascular diseases in first-degree relatives (OR = 1.60, 95% CI: 1.42–1.81) were associated with hypertension(21). However, in the same study abdominal obesity (OR = 1.29, 95% CI: 1.05–1.58) was associated with higher odds among women (22)

Metabolic risk factors

The reviewed studies have also a mention on the increase cholesterol levels and triglycerides as a factor associated with the occurrence of the cardio vascular diseases among women. There was an average increase in BMI (β = 1.03 kg/m2, 95% CI: 0.18, 1.89), waist circumference (β = 3.08 in., 95% CI: 1.06, 5.09), triglycerides (β = 4.47 mg/dl, 95% CI:−1.54, 10.49), and a decrease in HDL cholesterol (β = −1.60 mg/dl, 95% CI: −3.76, 0.56)(23) The overall prevalence of high blood pressure was 5.5%,

overweight/obesity accounted for about 23.1%, alcohol consumption and tobacco users were 23.9 and 2.4%, respectively was reported in a Nigerian study(26) One of the another Nigerian study reported that Only 2% consumed the recommended daily amount of fruits and vegetables and the prevalence of abdominal obesity (based on waist circumference) was 5% (1.3% in males and 8.4% in females), dyslipidemias (57.3%), pre-hypertension (8.2%), hypertension (2.8%), and pre-diabetes (1.0%). Obesity was positively associated with consumption of alcohol ($\chi 2 = 3.299$, $p < 0.001$)(27)
The detail report of the review framework has been mentioned in table 1.

DISCUSSION

The present review aimed to outline the risk factors prevalent in women, which were causing the specified non communicable diseases like diabetes mellitus, hypertension and cardiovascular diseases. The present review which focused on the prevalence of risk factors for chronic diseases among general adult women compiled the various risk factors associated with the prevalence of the chronic diseases. Behavioural risk factors like habit of tobacco and smoking constitutes for the prevalence of hypertension, dietary habits like decreased fruit intake and stress lead to cardio vascular diseases, bio physical factors like obesity, central obesity and increased blood pressure were related to the prevalence of type 2 diabetes mellitus. Few of the studies also had a mentioning on the increased cholesterol and triglycerides level leading to the prevalence of cardio vascular diseases.
However systematic reviews conducted with regard to the general women cohort was rare to the best of our knowledge. Very few handpicked reviews have been found in our search which were analysed for the similarities of our review. A systematic review done on the risk factors and prevalence of non communicable diseases outlines that overweight/obesity, mental illness (stress) were closely associated with the prevalence of non communicable diseases including cardio vascular diseases (28). Another review which has compiled the NHS data suggested the strongly the incidence of cardiovascular diseases that was determined and associated with the unhealthy diet, smoking, obesity, physical inactivity, and unhealthy sleep patterns (30)

Table 1 Summary of the results of risk factors of NCD among women

Author, Year of publication	Place of study	Design	Population	Results
	Behavioural factors (tobacco, smoking, diet, physical inactivity)			
Vivek K. Mishra, 2022(13)	India	A cross sectional survey	699,686 women aged 15–49 years	The population attributable risk of having NCDs was 1.8% ($p < 0.001$) for women who smoked, 0.8% ($p < 0.001$) for women who consumed smokeless tobacco and 2.2% ($p < 0.001$) for women who consumed alcohol. Besides, the odds of having NCDs among overweight and obese women were 2.25 and 3.60 times greater than the odds of having NCDs among women who were underweight [13].
Biplab K data, 2021(14)	India	Cross sectional survey	356,853, women of age 20 – 35	The odds of having uncontrolled hypertension for the tobacco user women in India was 1.1 (95% CI: 1.01–1.19) times that of tobacco non-users at prime childbearing age. The odds were also higher for tobacco-users who were overweight (1.88, 95% CI: 1.57–2.29) or obese (2.82, 95% CI: 1.88–4.24) [14].
Zheilei shan, 2018(15)	US	Prospective cohort study	143 410 women without type 2 diabetes, cardiovascular disease, or cancer at baseline.	Unhealthy lifestyle factor with type 2 diabetes, the hazard ratio was 2.83 (2.15 to 3.73) with a significant additive interaction (P for interaction <0.001). The proportions of the joint association were 71.2% (66.9% to 75.8%) for unhealthy lifestyle alone [15]
Melissa L. Harris,2017 (16)	Australia	Longitudinal survey	12844 adult women	Women reported low levels of physical activity (compared to those with moderate or high levels) were 1-54 times more likely to report type 2 diabetes (95%CI 1.33, 1.79; *P*<0.001) [16].
Jonetta Johnson	Brazil	Cross sectional	13,745 women between 18 –	Women with less than a college education were more likely to report physical inactivity

Mpofu, 2016(17)		telephonic survey	44 years	(adjusted relative risk (aRR) and 95% confidence interval = 1.1 (1.1–1.2)), smoking (aRR = 1.7 (1.3–2.2)), and selfreported diagnoses of hypertension (aRR=2.0 (1.6–2.5)) compared to women with a college education or greater [17].
Andrea K. Chomistek, SCD, 2014(18)	Boston	Prospective analysis	88,940 women ages 27 to 44 years	Approximately 73% (95% confidence interval: 39% to 89%) of CHD cases were attributable to poor adherence to a healthy lifestyle. Similarly, 46% (95% confidence interval: 43% to 49%) of clinical CVD risk factor cases were attributable to a poor lifestyle [18].
Bio physical (Overweight, obesity, central obesity, increased blood pressure)				
Chowdhury MAB, 2021(19)	Kenya	Cross sectional survey	35682 women of age 15 - 45years	Overall, 9.38% of the women were hypertensive with higher prevalence among urban 11.61%, compared to rural women, 7.86%. Older age, obesity, having diabetes, and increased the odds of hypertension in both rural and urban areas [19].
Jessie Pinchoff 2020(20)	Tanzania	Cross sectional survey	2212 adult women between 15-49 years	23% had elevated C Reactive Protein (a measure to chronic inflammation which predicts the cardio vascular diseases), 21% were overweight or obese. A strong positive association between both CRP and BMI was found [20].
Bihungum Bista,, 2020(21)	Nepal	Cross sectional survey	6,396 women age 15 to 49 years	A total of 8.9% of participants were smokers, 22.2% were overweight and obesity and 11.5% of the participants were hypertensive. Risk factors were more likely to cluster in women of age40-49 years (ARR = 2.95, 95%CI: 2.58– 3.38), widow/separated (ARR = 3.09; 95% CI:2.24–4.28) [21]
Ying Zhou, 2018(22)	China	Cross sectional survey	6324 women over 35 years	Overweight (OR = 1.97, 95% CI: 1.72–2.25), obesity (OR = 2.97, 95% CI: 2.30–3.84), diabetes mellitus (OR = 2.13, 95% CI: 1.73–2.62), high triglycerides (OR = 1.41, 95% CI: 1.20–1.65), and history of cardiovascular diseases in first-degree relatives (OR = 1.60, 95% CI: 1.42–1.81) were associated with hypertension in all participants. However, abdominal obesity (OR = 1.29, 95% CI: 1.05–1.58) was associated with higher odds among postmenopausal only [22].
Metabolic (increased cholesterol/ triglycerides)				
Sanni Yaya,2021(23)	Kenya	Cross sectional survey	14728 adult women between 15-49 years	The prevalence of self-reported high blood pressure and diabetes were 9.4% and 1.3%, respectively. Women with secondary [aOR = 1.53; 95% CI = 1.15–2.02] and primary [aOR = 1.48; 95% CI = 1.15–1.92] levels of education were more likely to report having high blood pressure, compared to those with no formal education [23].
Shruthi Mahalingaiah, 2017(24)	Framingham	A correlational study	1968 adult women	There was an average increase in BMI (β = 1.03 kg/m2, 95% CI: 0.18, 1.89), waist circumference (β = 3.08 in., 95% CI: 1.06, 5.09), triglycerides (β = 4.47 mg/dl, 95% CI:−1.54, 10.49), and a decrease in HDL cholesterol (β = −1.60 mg/dl, 95% CI: −3.76, 0.56) [24].
Combined risk factors (behavioural, & biophysical)				
Rajarajan Kayaroganam, 2022(25)	Pondicherry	Cross sectional survey	1217 Nurses working in Tertiary care hospital	Tobacco use and alcohol consumption were 1.5% and 2.9% respectively, Overweight or obesity (body mass index ≥23 kg/m2) was 77.7%, with a significantly higher prevalence among those aged ≥ 30 and married. Prevalence of high BP was 14.4% (95% CI: 12.5-16.4), and

				blood glucose was 11.5% (95% CI: 9.7-13.6). Both were significantly higher among those aged ≥50 years. One-third of nurses, 34.3% (95% CI: 31.6-37.1), had high cholesterol level [25].
Sanni Yaya, 2018(26)	Nigeria	Cross sectional survey	454080 adult women of reproductive age	More so, alcohol consumption prevalence was 4.1–47.3% and tobacco use was 0.3–9.9%. The overall prevalence of high blood pressure was 5.5%, overweight/obesity accounted for about 23.1%, alcohol consumption and tobacco users were 23.9 and 2.4%, respectively [26].
F. A. Olatona, 2018(27)	Lagos State, Nigeria	A correlational study	506 adults	Only 2% consumed the recommended daily amount of fruits and vegetables. Prevalence of abdominal obesity (based on waist circumference) was 5% (1.3% in males and 8.4% in females), dyslipidemias (57.3%), pre-hypertension (8.2%), hypertension (2.8%), and pre-diabetes (1.0%). Obesity was positively associated with consumption of alcohol ($\chi 2 = 3.299$, $p < 0.001$) [27].

CONCLUSION

The current work of review on the risk factors of the non communicable diseases among women had brought a good insight of the factors associated with the prevailing chronic diseases among women. The review had compiled the factors like tobacco and smoking habits, poor dietary habits, decreased physical activity, overweight/obesity, central obesity were considered as the common risk factors of non communicable diseases among women. It was also found that metabolic factors like elevated cholesterol, and triglycerides were also considered as the risk factor for chronic diseases including cardiovascular diseases.

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