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Physical Inactivity and Its Association with Hypertension in Adult Female Population of Srinagar, India: a Community-Based Cross-Sectional Study

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ABSTRACT

Background: Prevalence of physical inactivity is rising in many countries including the developing countries like India, with major implications for the general health of people.This study was carried out with an objective to find the prevalence of Physical inactivity and its association with Hypertension in adult female population of district Srinagar.

Methods: A cross-sectional community-based study was carried out among 800 female subjects of age group >18 years during September 2017 to February 2018. Multi stage random sampling method was used and Hypertension was classified as per the 2017 guideline (updated JNC 7). Physical Activity was measured using IPAQ short form.

Results: Prevalence of Physical Inactivity of 50.2%. Overall prevalence of Hypertension was 65.1% (Stage1=38.6% and Stage2=26.5). There was a linear positive correlation between Age with Diastolic Blood Pressure and Systolic Blood Pressure.The bivariate logistic regression indicated that risk of Physical inactivity increased with increasing age, marital and blood pressure status after adjusting for the effect of other variables in the model.

Conclusions: This study demonstrated that there is high prevalence of physical inactivity among adult women population of Srinagar which has a strong association with Hypertension.

Keywords: Physical inactivity,Hypertension, Waist circumference, Body Mass Index

INTRODUCTION

Non-communicable diseases (NCDs) are the main source of disease burden worldwide and are thus a major public health problem[1]. Among NCDs, hypertension has been shown to have the highest prevalence in adults[2]. The common factors that influence blood pressure levels includesmoking, obesity, physical inactivity (PA) and sedentary behaviour which are directly associated withblood pressure[3-5].Physical inactivity has been identified as a major risk factor for cardiovascular diseases. Previous studies found that most people who suffered a heart attack and people with hypertension did not perform any kind of physical activity[6,7]

Physical inactivity has been found to be the fourth leading risk factor for global mortality (6% of global deaths). This is followed by the Hypertension (13%), tobacco use (9%) and Diabetes (6%). Overweight and obesity are responsible for 5% of global mortality[8]. Prevalence of physical inactivity is rising in many countries including the developing countries like India, with major implications for the general health of people and for the prevalence of NCDs such as cardiovascular disease, diabetes and cancer and their risk factors such as Hypertension, Diabetes and Obesity.

In our previous study conducted in Block Hazratbal of Srinagar district Kashmir, India, it was

found that the prevalence of hypertension,which was classified as per the 2017 guideline, an update of the "Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure" (JNC 7) [9]to be 63.7% (Stage1=43.0% and Stage2=20.7%) with females having higher prevalence than males[10].Theprevalence of obesity as defined by Waist circumference was found to be high (50%) in the study population, especially females (71.3%) putting them at increased risk for the hypertension as supported by the strong positive correlation in the study. The typical climatic conditions of Kashmirvalley and sedentary behaviour of the women who like to stay at home in thispart of the world seem to be responsible for high prevalence of obesityleading to the hypertension. In order to validate the findings, it was decided to conduct a study in same blockamong adult females with larger sample and taking their physical activity in consideration as per IPAQ 2005guidelines[11].Thus, the study was carried out with an objective to find the prevalence of Physical inactivityand its association with hypertension in adult femalepopulation of district Srinagar, India.

METHODS

The study undertaken was a cross sectional community-based study, done among 800female subjects of age group >18 years in Medical block Hazratbal of districtSrinagar, which is the field practice area of Department of CommunityMedicine, GMC Srinagar with an estimated population of 82,000 duringperiod September 2017 to February 2018. Block Hazratbal has a mixed population and is ethno-topographically divided into three groups – Tribal area, Dal lake inhabitants and Urban area. Sample size estimation Sample size was calculated by using WHO statistical formula for sample size determination: $n = Z^2 P (1 – P)/ d^2$, where n = sample size, Z = Z statistic for a level of confidence (1.96), P = prevalence of physical inactivity (50%, P = 0.5), and d = absolute precision (if 5%, d = 0.05)[12]

As on date, no such baseline community-based study has been donein district Srinagar, so to estimate 'P', a figure of 50% was taken. The sample size of 768 was calculated by adjusting with design effect of 2.Informed/verbal consent was taken prior to interview and anthropometricmeasurement.

Sampling method: A multi stage random sampling technique was used to give equal representation to all the female subjects in the selected block and it was decided to select 200female subjects from each of four PHCs viz; Hazratbal, Harwan,Nishat, and Tailbalthat came out to be 800. Therefore, a total of800 subjects were included in the study.

Inclusion criteria: Females aged 18 years and above willing toparticipate in the study were included in the study.

Exclusion criteria: Persons having acute illness, deaf & mute person, or other communicationbarrier, Subjects on long term medication for chronic diseases, or Migrants were excluded from the study.

Instruments used for data collection

Physical Activity (PA) was measured using IPAQ short form which is an instrument designed primarily for population surveillance ofphysical activity among adults (age range of 15-69 years)[11]. IPAQ assesses physical activity across a comprehensive set ofdomains like:

1. Leisure time physical activities.
2. Domestic and gardening physical activities.
3. Work related physical activities.
4. Transport related physical activities.

In this form three specific types of activitiesassessed were walking, moderate-intensity activities and vigorous-intensityactivities.The items in the shortIPAQ form were structured to provide separate scores onwalking, moderate-intensity and vigorous-intensity activity. Computation of thetotal score for the short form requires summation of the duration (in minutes)and frequency (days) of walking, moderateintensity and vigorousintensityactivities.Rationale used for the cut offvalues were categorised into three levels of physical activity:

1. **Low:** This is the lowest level of physical activity and those individuals who do not meet categories 2 or 3criteria are classifiedinto 'low' physical activity level.
2. **Moderate:** Individuals are classified as 'moderate' if at least one of the below criteria are met:
   a) 3 or more days of vigorousintensity activity of at least 20 minutes per day.
   b) 5 or more days of moderateintensity activity and/or walking of at least 30minutes per day.
   c) 5 or more days of any combination of walking, moderateintensity or vigorousintensity activities achieving a minimum total physical activity of at least 600 MET (Metabolic Equivalent of Task) minutes/week.
3. **High:** The two criteria should be met for classification as 'high':

a) Atleast 3 days of vigorous intensity activityand achieving a minimum totalphysical activity of at least 1500 METminutes/week.

b) 7 or more days of any combination of walking, moderate-intensity or vigorous intensity activities and achieving a minimum total physical activityof at least 3000 METminutes/week.

In current study PA was considered as a binary variable and subjects falling in low category of PA were taken as physically inactive, and those with moderate or high categories were considered as physically active.

Blood pressure was recorded using a standard mercurysphygmomanometer standardized and checked regularly tominimize errors and two readings were taken with the subject in a relaxed and sitting position. A standard stethoscope was used to record the blood pressure. Hypertension was classified as per the "Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure"(JNC 7)[9]. As per the guidelines the Blood pressure is categorized as:

Normal BP= <120/<80 mm Hg
Elevated BP =120-129/<80 mm Hg
Hypertension stage 1= 130-139 or 80-89 mm Hg
Hypertension stage 2= ≥140 or ≥90 mm Hg.

A non-elastic graduated measuring tape was used to measure Waist circumference in standing position and after exhaling second normalbreath.It was measured as the narrowest circumference of the trunk and thelevel of the last rib was taken into account when the position of thenarrowest circumference could not be identified[13,14]. Cut-off points used todefine the obesity were ≥ 80 cm[15].

BMI was calculated by using a stiff and non-elastic measuring tapeto measure height and a bathroom weighing machine to measure the weight of the subjects which was regularly calibrated and checked for error. The modified classification of BMI for Asian populations was used in this study to define overweight (23-24.99kg/m2) & obesity (> 25 kg/m2)[16,17]. Subjects were categorized by age into young adults (aged 18-35 years), middle-aged adults (aged 36-55 years), and older adults (older than 55years)[18].

Table 1: Comparison of Physical Activity Categories with Sociodemographic Variables (n=800)

Variable	Physically Active (n=398)	Physically Inactive (n=402)	P value
Age (Mean±SD yrs)	39.12 ± 14.20	39.27 ± 14.29	<0.05
WC (Mean±SD cm)	88.46 ± 11.72	90.43 ± 13.14	<0.05
BMI (Mean±SD kg/m^2)	23.54 ± 4.39	25.45 ± 4.73	<0.005
SBP (Mean±SD mmHg)	132.19 ± 17.24	139.18 ± 20.82	<0.005
DBP (Mean±SD mmHg)	77.09 ± 10.28	79.59 ± 11.14	<0.001
Age Groups (%)			
Young Adults	206(51.8)	185(46.0)	0.002
Middle aged Adults	150(37.7)	134(33.3)	
Older Adults	42(10.6)	83(20.6)	
WC Category (%)			
Normal	112(28.1)	91(22.6)	0.050
High	286(71.9)	311(77.4)	
BMI Category (%)			
Underweight	48(12.1)	21(5.2)	<0.001
Normal	152(38.2)	105(26.1)	
Overweight	41(10.3)	66(16.4)	
Pre-Obese	135(33.9)	146(36.3)	
Obese	22(5.5)	64(15.9)	
Hypertension Groups (%)			
Normal	99(24.9)	62(15.4)	<0.001
Elevated	72(18.1)	46(11.4)	
HTN Stage 1	141(35.4)	168(41.8)	
HTN stage 2	86(21.6)	126(31.3)	
Marital Status (%)			
Unmarried	102(25.6)	92(22.9)	<0.001
Married	291(73.1)	280(69.7)	
Separated/Widow/Never Married	5(1.3)	30(7.5)	
Socio Economic Class (%)			
Upper Class	63(15.8)	52(12.9)	0.375
Upper Middle Class	99(24.9)	97(24.1)	
Middle Class	139(34.9)	131(32.6)	
Lower Middle Class	94(23.6)	119(29.6)	
Lower Class	3(0.8)	3(0.7)	

Table 2: Distribution of Subjects as per Age groups and Blood Pressure Category

Age Groups (Years)	Normal	Elevated	Hypertension Stage 1	Hypertension Stage 2	Total	P Value
Young Adults (18-35)	120 (30.7)	78 (19.9)	169 (43.2)	24 (6.1)	391	<0.001
Middle Aged Adults (36-54)	32 (11.3)	33 (11.6)	109 (38.4)	110 (38.7)	284	
Older Adults (>54)	9 (7.2)	7 (5.6)	31 (24.8)	78 (62.4)	125	
Total	161 (20.1)	118 (14.8)	309 (38.6)	212 (26.5)	800	

Table 3: Bivariate logistic regression for predictor factors of Physical Inactivity

Variables	No. of Subjects	Odd Ratio (95% CI)	p value
Age Groups			
Young Adults (18-35)	391	1(Ref.)	
Middle Aged Adults (36-54)	284	1.44(0.86-2.42)	<0.16
Older Adults (>54)	125	1.80(1.14-2.85)	<0.01
Marital Status			
Unmarried	194	1(Ref.)	
Married	571	4.88(1.71-13.94)	<0.00
Separated/Widow/Never Married	35	5.11(1.91-13.69)	<0.00
Blood Pressure category			
Normal	161	1(Ref.)	
Elevated	118	2.10(1.30-3.38)	<0.00
HTN Stage 1	309	2.06(1.24-3.42)	<0.00
HTN stage 2	212	1.07(0.72-1.58)	<0.73

Level of Physical Inactivity Predictors	OMN (Sig.)	Wald	HL	R^2	-2 Log
Age	48.3 (0.000)	6.569 (0.037)	2.003 (0.981)	0.078	1060.64
Marital Status		10.590 (0.005)			
Blood Pressure categories		18.237 (0.000)			

[Where, OMN (Omnibus test); HL (Hosmer and Lemeshow test); Wald (Wald test);
R2 (Nagelkerke coefficient of determination); -2 Log (log likelihood ratio)]

RESULTS

Among 800 female subjects, 402(50.2%) were found to be physically inactive (Low physical activity) and 398 (49.8%) physically active (39.4% moderately active and 10.4% highly active). Socio-demographic characteristics of the studyparticipants are reported in Table 1. Comparison of these Physical inactivity (Low physical activity) and Physically activity (Moderate physical activity or High physical activity) for Socio economic class which was classified as per Modified BG Prasad scale[19]and other various continuous and categorical variables is shown in Table 1. Except for Socio Economic class, in all other variables a statisticallysignificant difference was found as shown by p value in Table 1. More than half of the study population, 66.3% were housemakers, 16.8% students, 9.7% salaried and skilled workers and rest were engaged in other occupations. In the study population it was noticed that most of subjects with low physical activity were associated with Hypertension as shown in Figure 1.

The overall prevalence of Hypertension in the current study was found to be 65.1% with (Stage1=38.6% and Stage2=26.5%). The distribution of hypertensive subjects among various age groups is shown in Figure 2, and the difference was found statistically significant (Table 2). There was a linear positive medium to large correlation between Age and Diastolic Blood Pressure (DBP) andSystolic Blood Pressure (SBP), (r=0.362 for DBP and r=0.548 for SBP) with statistically significant p value <0.005. Similar results were obtained when Waist Circumference (WC) and Body Mass Index (BMI) werecorrelated with SBP (r=0.404, p <0.005 and r=0.292, p<0.005) respectively.

The bivariate logistic regression indicated that risk of physical inactivity increased with increasing age, after adjusting for the effect of other variables in the model as shown in Table 3. Married, Widowed, Separates or never Married were at five times higher risk for physically inactivity as shown in Table 3 and the difference was statistically significant. Almost similar results were found in case of Elevated Blood Pressure and Hypertensive subjects and the p value was again statistically significant.

DISCUSSION

In this study a high prevalence of Physical inactivity among adult females (50.2%) was found in the study population. Studies conducted in different parts of the world also got same results of high prevalence of Physical inactivity[20,21]. Al Hazza et al in Saudi Arabia found the prevalence of physical inactivity to be 40.6% using the IPAQ to assess Physical inactivity[21].

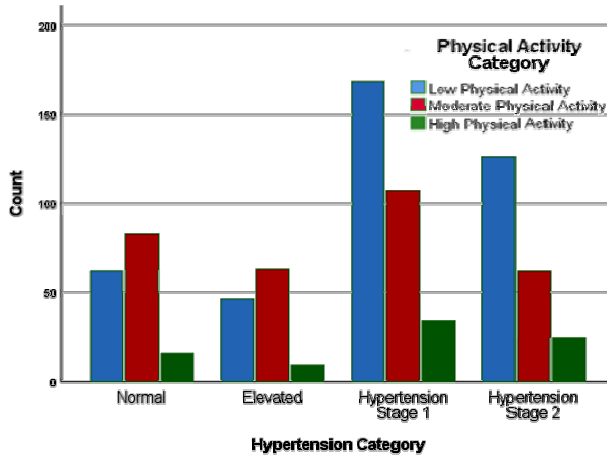

Figure 1: Distribution of Subjects as per Physical Activity and Blood Pressure Category

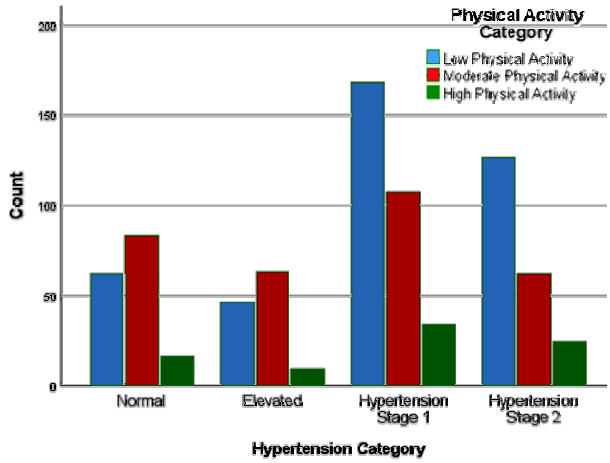

Figure 2: Distribution of Subjects as per Age groups and Blood Pressure Category.

David Kahan in 2014 found Muslim females were at high risk of obesity and high prevalence of Physical inactivity (32.3%) was found in them[22]. Cold climatic conditions of Kashmir valley and sedentary habits of the women who like to stay at home is the main reason for the high prevalence of physical inactivity in this part of the world. This is supported by the results of the currentstudy which showed 66.4% females were house makers. Moreover, the higher prevalence of Physical inactivity among females is more likely due to social and cultural factors rather than biological[23]. Culturally, women in this Kashmir are not expected to practice physical activities in public. Low levels of physical activity identified in this study were also possibly influenced by socioeconomic conditions, considering that a large part of the study population belong to lower and middle class of socioeconomic class, which can have effect on utilization of free time for physical activity. Socioeconomic differences play a vital role in health conditions for various reasons, such as access to the health care system, level of health information and understanding of the problem.

The prevalence of hypertension among adult females in this study which was classified as per the 2017 guideline, an update of the "Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure" (JNC 7)[9]was 65.1% with (Stage1=38.6% and Stage2=26.5%). As per WHO the prevalence of hypertension in India was about 36.0in males and 34.2 in females in 2008[24].Studies carried out in different populations ofIndia like Sikkim, Andhra Pradesh, Rajasthan, and Orissa havedocumented the prevalence of hypertension from 15-42 per cent[25].Masoodi ZA et al conducted a study in 2016 in district Budgam of Kashmir valley and found the prevalence of hypertension to be 34.1%[26]. The main reason for the higher prevalence in current study is use of the Seventh Report of the Joint NationalCommittee VII (Indian scenario) classification where Stage 1 Hypertension (120-139/80-89 mmHg) falls in pre-hypertension range in older classification[27-29].

In current study a positive correlation was found between Waist circumference and Body mass index with Blood pressure, more so with Waist circumference as a risk factor for Hypertension among obese and physically inactive women, which can be easily measured by individuals themselves just like weight at home and is subject to a minimal bias of 5% towards underestimation. These finding were consistent with the studies conducted by Lean et al and Okosum et al[30,31].The strong association between excess BMI and the occurrence of Hypertension indicates the urgent need for measures capable of influencing identification of risk indicators of obesity and hence hypertension in populations[32].

In our study as shown by bivariate logistic regression in results, the risk of physical inactivity increased with increasing age, marital and blood pressure status of the study population. Middle aged and older adults, widowed or separated women and hypertensive women are at increased risk of physical inactivity andhence a vicious circle of obesity and hypertension which are related to each other.

LIMITATIONS OF THE STUDY

The limitations of the study include the cross-sectional design with only female population included in the study, so caution must be taken on casualty assessment and gender specific analysis. Single blood pressure readings are considered less accurate and a patient can only be clinically diag-

nosed as hypertensive if there is persistent hypertension on repeated visits. This limitation was overcome by taking mean of two readings which is considered acceptable for field studies.IPAQ short forminstrument, used in this study typically overestimate moderate-to-vigorous physical activity, so the prevalence estimatesshould be cautiously interpreted and Physical inactivityprevalence may be in fact higher than this. This study involved only Waist circumference and Body Mass Index as obesity measures and other anthropometric indices like Waist to hip ratio and Waist to height ratio, were not used to keep the results concise, although WC and BMI is the only clinical index of obesity associated with conventional Hypertension independent of other indices as per different studies.

CONCLUSION AND RECOMMENDATIONS

The results of the study demonstrated that there is high prevalence of physical inactivity among adult women population of Srinagar which has a strong association with Hypertension.There is a need for focusing on the development of strategies that encourage the adoption of regular physical activity as a way to control and prevent the noncommunicable diseases. In view of thesedentary lifestyle problem, we recommend the supplementation and expansion of actions able to change the behaviour of populations with a view to promote physical activity so as to diminish the prevalence of hypertension and other NCDsand hence their complications. In this regard the intervention programs should be designed toincrease the physical activity among this section of population through behaviour changes, lifestyle modification, including diet and exercise, which can public health importance in reducing the incidence of hypertension.

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