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Socio Economic Factors Associated with Prevalence of Non-Communicable Diseases among Adults in Punjab, Pakistan

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ABSTRACT

Background: Non-communicable diseases (NCDs) such as cardiovascular disease, cancer, chronic respiratory diseases, and diabetes are leading causes of global mortality and disability. Addressing the impact of NCDs aligns with sustainable development goals. **Objective:** The objective of this paper is to use individual data to investigate the risk factors for non-communicable diseases (NCDs) among adults in Pakistan. **Study Design:** Questionnaire-based cross-sectional study. **Settings:** A sample of 376 patients was selected using a single population proportion due to a lack of data. Participants were chosen through consecutive sampling in three cities: Sialkot, Faisalabad, and Layyah Pakistan. **Duration:** Over 14 months. **Methods:** Descriptive and multinomial logistic regression analyses were conducted to assess the relationship between various factors and the prevalence of specific non-communicable diseases (NCDs). **Results:** This study seeks to identify NCD determinants to inform effective prevention and intervention strategies. Age emerges as a primary predictor, with individuals aged 36–55 and above exhibiting higher odds of NCD prevalence than those under 35. Gender also matters, as females have a higher likelihood of NCDs. Urban living is linked to elevated NCD risk due to sedentary lifestyles. Income shows a positive association with NCD susceptibility, although it decreases at higher levels. Smoking, excessive caffeinated or carbonated drink consumption and eating out elevate NCD risk. Conversely, consuming fruits and vegetables, engaging in physical activity, and getting sufficient sleep lower susceptibility. A positive family NCD history increases the likelihood of experiencing NCDs. **Conclusion:** These findings underscore the need for comprehensive policy interventions to alleviate the NCD burden. Addressing modifiable risk factors like smoking and unhealthy diets is critical. Public awareness, community engagement, and regulatory measures are recommended. Collaborative efforts across sectors are essential for promoting health and preventing NCDs, while also addressing disparities and healthcare access. Overall, this study offers valuable insights for effective NCD combat strategies.

Keywords: *Non-communicable diseases (NCDs), Socioeconomic, Hypertension, Physical activity, Smoking, Pakistan.*

INTRODUCTION

Non-communicable diseases, such as cardiovascular disease, stroke, cancer, chronic respiratory diseases, and diabetes, are the primary cause of death and disability worldwide[1]. NCDs were responsible for 41 million deaths worldwide, with more than 75 percent of these in low and moderate income countries.[2] The recent increase in life expectancy and associated reduction in fertility rates across South Asia, which is associated with socioeconomic and economic modifications, resulted in a higher incidence of NCDs. High blood pressure, raised cholesterol levels, excess weight, insufficient intake of fruits and vegetables, obesity, physical inactivity, an unhealthy diet, and smoking are all risk factors for the development of NCDs.[3,4] These factors contribute significantly to the occurrence of major NCDs, which is generally referred to as the 'group of four' and are responsible for 80% of NCD-related mortalities. It should be noted that the vast majority of these risk factors are changeable.[5] The WHO Global Action Plan for NCD Control and Prevention has committed to focusing on nine independent global objectives with the aim of achieving a relative decrease of 25% in NCDs-related premature deaths by 2025.[6]

In Pakistan, similar to global trend NCDs are the main cause of mortality with contribution about 67% in total deaths ; showing a significant surge in recent decades [7,8]. Various studies have shown that in Pakistan, a large

proportion is suffering from hypertension, obesity, diabetes and cardiovascular diseases.[7,8,9]

Various behavioral factors like tobacco usage, lack of physical activity, and an unhealthy diet, in addition to the effects of aging contribute to an increased susceptibility to NCDs and the subsequent mortality linked to them.[10] The global rise in urban populations, and financial effluence lead to change in life styles that may lead to the adoption of unhealthy behaviors.[11,12]

A connection is noted between the prevalence of NCDs, and reduced physical activity[12], inadequate consumption of vegetables, coupled with excessive use of diets in saturated fats, salt, and calories[13] and an association[14] between hypertension and excessive salt consumption is also seen. The combined risk of these factors account for nearly 95 percent of NCDs prevalence.[15] Furthermore, socio-demographic elements like gender, age, educational attainment, and occupational status significantly contribute to the emergence of NCDs. Regrettably, the majority of these factors lie beyond an individual's control.

Presently, there exists a pressing requirement for comprehensive population-based assessments of NCDs prevalence within the population. With this objective in mind, the present study was conducted across three cities in Punjab province of Pakistan. The objective of this paper is to use individual data to investigate the risk factors of non-communicable diseases NCDs among adults in Pakistan.

METHODS

Sample size Determination and Sampling Technique: The sample size was calculated based on single population proportion due to lack of data.

$$\text{Sample size} = \frac{Z^2 \times P(1-P) / e^2}{1 + Z^2 \times P(1-P) / e^2 N} = 363 \text{ (at least)}$$

Where,

N= Population Size (infinite population) ,

Z = 1.96 ,

e = 5 %

P = 38 % (prevalence of NCDs in Pakistan WHO, 2021)

Following above, a comprehensive total of 390 respondents were meticulously chosen to participate in this research and excluding some responses owing to incomplete information, 376 were included in analysis. The study was conducted over the course of fourteen months, from October 2021 to December 2022 following consecutive sampling technique from three cities of the Punjab region i.e. Sialkot, Faisalabad, and Layyah.

Variables: Patient-related data was meticulously gathered from their medical records during hospital admission or routine checkup visits. The comprehensive dataset was acquired in face-to-face interviews of adult respondents through a semi-structured questionnaire, encompassing a wide array of aspects. These included demographic particulars and socioeconomic indicators such as gender, age, marital status, education, income, as well as metabolic indicators like high blood pressure, body mass index (BMI), and high blood cholesterol levels. Furthermore, behavioral risk factors like smoking habits, intake of fruits and vegetables, exercise and engagement in physical activity, sedentary lifestyle were documented carefully.

Multinomial Logistic Regression Analysis:

For the assessment of the strength and direction of the relationship between NCDs and their potential correlates, multinomial logistic regression was employed adjusting the odds ratio; for eight specific NCDs, namely, hypertension, diabetes, heart disease, high cholesterol, kidney issues, psychiatric illness, and joint pain.

The dependent variable was categorized into three distinct groups based on the number of NCDs suffered by a person: a single NCD, having two NCDs, or more than two NCDs. Within this model, a single category of the dependent variable is selected as the reference point (single NCD) against which all other categories are contextualized and elucidated.[16] The multinomial logit model, encompassing both the dependent and explanatory variables, can be concisely presented in equation form as follows:

$$Y_{(a,b)i} = ln \frac{Pr\,(Y = a,b)}{Pr\,(Y = c)} = \alpha_{a,b} + \sum_{j=1}^{J} \beta_{(a,b)j}\,(Z)_{ij} \ldots\ldots (1)$$

Where

Y=dependent variable like occurrence of NCD

N=a, b, c ; showing the categories of occurrence of NCD, Here the probability of *i*th individual is determined who is facing one of the *j*th outcomes i.e. occurrence of non-communicable diseases

The log odd ratio is estimated by multinomial logit model.

$$\text{Ln}\frac{\text{pr (Two NCDs}}{\text{pr(One NCD)}} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_k X_k \ldots\ldots\ldots\ldots (2)$$

$$\text{Ln}\frac{\text{pr (More than Two NCDs}}{\text{pr(One NCD)}} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_k X_k \ldots\ldots\ldots (3)$$

RESULTS

This study showed the prevalence of hypertension, in majority of respondents followed by diabetes, and cardiovascular disease while incidence of other NCDs like kidney disease, Cholesterol level, Joint pain, was reported by less than one third of respondents (Table 1).

The multivariable logistic regression analysis (Table 2) showed that there are higher odds of NCDs in respondents older than 35 years as compared to those less than 35 years old. The respondent from age group 36-55 and above 55 years were 2 and 1.33 times more likely to have the two NCDs respectively than respondents with age less than 35 years. Age serves as the primary predictor for the persistence of chronic illnesses, and the global rise in NCDs prevalence can be attributed to the aging phenomenon.[17] In Pakistan, being a female increases the likelihood of experiencing two or more than two NCDs than male counterparts. These findings align with the studies[18,19] all of which establish a positive correlation between the female gender and NCD occurrence. The results also found that residents of urban area are more likely to suffer from NCDs as compared to people living in rural areas. A significant negative coefficient for individual's income level suggested that households with higher income and higher education tend to be less susceptible to NCDs.

Respondents with habit of smoking, caffeinated drinks, and disturbed sleep order were more likely to suffer NCDs. A strong association is shown between working status and NCDs that may be explained in many ways. The respondents with normal BMI were less likely to have any of NCDs likewise those who have active life style with physical activity at least more than 30 minutes daily. Healthy eating also showed profound effect in developing health of a person as respondents taking more vegetables and fruits and with more preference of home prepared food were less likely to have NCDs as compared to others with contradictory preferences.

Table 1: Prevalence of Non-communicable Diseases in Pakistan

Non-communicable Diseases	Yes	Percentage	No	Percentage
Hypertension	182	48.66%	194	51.87%
Diabetes	225	60.16%	151	40.37%
Cardiovascular Disease	154	41.18%	222	59.36%
Kidney disease	86	22.99%	290	77.54%
Cholesterol Level	112	29.95%	264	70.59%
Joint pain	121	32.35%	255	68.18%
Psychological Health	157	41.98%	219	58.56%

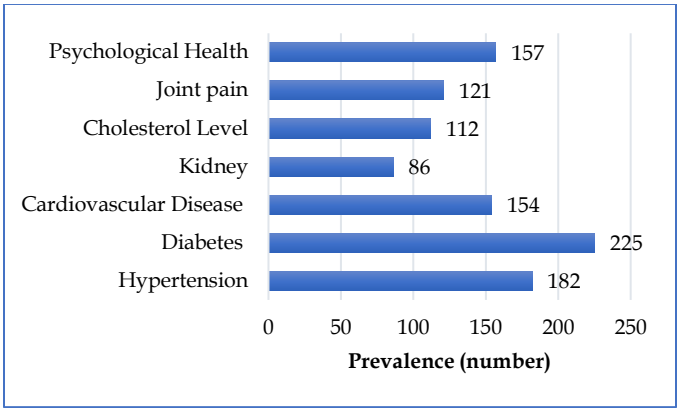
Source: Author's Own Computations (Survey Data 2021-22)

Table 2: Multinomial logistic regression showing association between Non-Communicable Diseases and its risk factors in Pakistan

Individual-level factors	Exp(β)	
	two diseases	more than two dieses
	Ref:(one NCD)	
Age (in years) (ref: <35)		
35-55	2.039 (0.368)	1.761** (0.384)
≥55	1.332* (0.325)	1.073 (0.343)
Gender (ref: Male)		
Female	1.488 (0.315)	1.253** (0.337)
Marital Status (ref: Never married)		
Currently married	1.016 (0.337)	1.083 (0.369)
Residence (ref: Rural)		
Urban	1.246* (0.282)	1.959* (0.298)
Income Level (ref: < 50,000)		
50,000-75,000	0.483** (0.33)	0.856 (0.358)
above 75,000	0.436* (0.371)	0.526 (0.405)
Education (ref: Higher)		
No education/Primary	1.231 (0.353)	2.976 (0.386)
Secondary	1.049 (0.411)	3.271 (0.436)
Working status (ref: Not working /unemployed)		
Working	2.345 (0.396)	1.512 (0.352)
Smoking status (ref: No)		
Yes	1.503** (0.351)	1.494** (0.38)
Caffeinated/Carbonated drink (ref: No/ occasionally)		
Yes/often	1.354 (0.274)	1.513* (0.29)
BMI Range (overweight/underweight)		
BMI range (ref: Normal)	0.768 (0.279)	0.568** (0.297)
Physical activity duration (less than 30 min.)		
Physical activity duration (up to 1 hr)	0.449* (0.288)	0.667** (0.311)
Sedentary lifestyle (ref: less than 4 hrs.)		
More than 4 hrs.	0.832 (0.286)	0.733** (0.301)
Sleep (disturbed) (ref: No)		
Yes	1.125* (0.285)	1.182* (0.297)
Sedentary lifestyle (ref: less than 4 hrs.)		
More than 4 hrs.	0.832 (0.286)	0.733** (0.301)
Sleep (disturbed) (ref: No)		
Yes	1.125* (0.285)	1.182* (0.297)
Fruit and/or vegetable consumption ek (ref: Less than five servings per week)		
Five or more servings per week	0.939 (0.281)	0.692** (0.304)
Prefer eating foods prepared outside of a home (ref: No)		
Yes	1.310* (0.371)	3.194* (0.359)
Family History of Disease (ref: No)		
Yes	1.174 (0.314)	1.359** (0.32)
Constant	0.038 (0.753)	1.848 (0.833)

*Source: Author's Own Computations (Survey Data 2021-22), Standard errors in parentheses * p<0.01, ** p<0.05*

Figure 1: Prevalence of Non- Communicable Diseases in Pakistan



DISCUSSION

Several social, behavioral, and biological risk factors influence the likelihood of suffering from NCDs. Diabetes was found to be the major NCD along with hypertension in Pakistan. When considered other factors like age this phenomenon becomes more clear that prevalence of NCDs increases with age[17] having link with burden of responsibilities that increase after marriage and in working age. Concurrently, the importance of this association is underscored by indications of early aging within the adult population in terms of health conditions. Chronic stress, repeated exposure to infectious diseases, and persistent sickness stemming from harsh living conditions potentially contribute to the premature aging of organs and bodily systems, consequently influencing the incidence of NCDs. These study findings align with research by,[20,21] as they highlight the age-related increase in biological risk.

Women exhibit higher odds of NCDs prevalence in comparison to men. The primary driver behind the escalating burden of NCDs among women[18,19] could be attributed to both biological and societal distinctions[22] existing between men and women. The latter aspect is particularly pronounced within Pakistani society, which remains entrenched in traditional norms that often marginalize women from a young age. This marginalization frequently hampers their psychological well-being, leading these women to perceive themselves as secondary family members, thereby ignoring their own health and wellbeing. Urban residents are associated with a significantly high-risk factor group that enhances the likelihood of having a NCD because of insufficient levels of exercise and physical activity in an urban lifestyle.[23,24] Lower income respondents were more likely to suffer from NCDs and these findings align with the conclusions[25,26] who concurred that poorer families face greater vulnerability to behavioral factors associated with NCDs compared to wealthier counterparts. The former engage in detrimental practices such as excessive smoking[27], unhealthy dietary habits, and limited access to healthcare and knowledge regarding NCDs prevention and treatment.

Better eating behavior may lead to better health and less prevalence of NCDs. On contrary higher consumption of soft drinks can lead to change in the BMI owing to high risks of weight gain and diabetes that further associated with higher risk of more than one NCDs.[28,29] Insufficient fruit and vegetable intake contributes to around 41 percent of NCDs, including conditions like coronary heart disease and ischemic stroke while higher vegetable and fruit consumption[2,30] can decrease the risk of NCD development.

The findings reveal that individuals who were physically active have less probabilities of developing a NCDs.[31] while physical inactivity is linked to various indicators of excess body weight, elevating overall mortality risk and susceptibility to conditions such as diabetes, heart disease, stroke, cancers, and chronic kidney disease. [32]

Moreover, the study finds positive association between sleep disturbance and the likelihood of suffering from NCDs. Deprivation and poor sleep quality have been connected to a range of metabolic disorders, including obesity and type 2 diabetes. Inadequate sleep and sleep disruptions may trigger pathological processes and contribute to disease onset, with a stronger focus on cardiovascular diseases.[33,34]

Food consumed away from home conventionally refers to food items that are obtained, although not exclusively, from restaurants, cafeterias, food trucks, street outlets, or vending machines[35] and is associated with an increased risk of non-communicable diseases. Such diets can lead to obesity due to their high calorie, sugar, and fat content. Processed foods in these meals may raise the risk of type 2 diabetes by causing insulin resistance. Cardiovascular disease risk rises due to unhealthy fats and a sodium in restaurant meals. Additionally, diets rich in additives found in such foods might heighten the risk of certain cancers. A balanced diet centered on whole, unprocessed foods is crucial for NCD prevention.[36]

The findings additionally indicate that individuals possessing a positive family history of disease are associated with a 1.359 times higher likelihood of experiencing a non-communicable diseases (NCDs). Family history stands as a predictive factor for heightened vulnerability to diseases due to interplay between genetic traits, environmental influences, and behaviors. These factors are shared to a greater extent within families than across the general population, making their disentanglement notably challenging.[37]

CONCLUSION & POLICY RECOMMENDATIONS

This paper examines factors related to NCDs to provide insights into the strategies to be adopted by individuals, policymakers, and researchers in addressing the escalating prevalence of NCDs and their profound impact on households.

The estimation reveals notable risk factors like high BMI, sedentary behavior, sleep disturbances, insufficient intake of fruits and vegetables, cigarette smoking, and excessive consumption of caffeinated/carbonated beverages. Furthermore, socio-economic and demographic facets, including income, age, urban residency, education, gender, and family medical history, exert influence on NCD prevalence in Pakistan.

This investigation emphasizes the imperative for the Pakistani healthcare system to establish mechanisms prioritizing preventive NCD care. The implementation of effective prevention strategies that target NCD risk factors is preferable over costly and prolonged treatment methods. Policy intervention in the form of regulatory measures addressing carbonated drink and cigarette consumption is necessary along with introduction of interventions like public awareness regarding healthy lifestyles, encompassing balanced use of fruits and vegetables coupled with physical activity. Increase in the number of sports and health clubs is highly required to reduce not only obesity, cardiovascular diseases but also for reduction in hypertension. Healthy social networks and activities can play better roles in the endeavor to moderate NCDs for which diverse stakeholders, including health, education, sports, environment, and media entities, must collaborate to devise plans. Health promotion initiatives have the potential to influence lifestyle factors, further facilitated by improved education and augmented by policies that regulate tobacco, carbonated beverages, and fast-food consumption.

LIMITATIONS

1. This study was conducted only in three districts and for more precision, this study needs to be extended in further regions of the country.
2. The respondents were mostly taken from hospitals or clinics and sample taken from general population may have different results.

CONFLICT OF INTEREST / DISCLOSURE

All the respondents were well informed about the study and their confidentiality is well maintained. Further, no conflict of interest exists between authors.

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