ORIGINAL ARTICLE
Determinants of Dietary Pattern & Non Communicable Diseases among Adult Population of Districts Kohat & Nowshera Khyber Pakhtunkhwa Pakistan

MUHAMMAD JIBRAN KHAN[1], SYED JAWAD HUSSAIN[1], NADIA QAZI[2], ANWAR KHAN WAZIR[3], ABDUL HAQ WAZIR[4], INAYAT SHAH[5], MUHAMMAD ISHTIAQ[6]
[1]Department of Community Medicine, KIMS (KMU-Institute of Medical Sciences), Kohat, Khyber Pakhtunkhwa, Pakistan
[2]Department of Community Medicine, Northwest School of Medicine, Hayatabad, Peshawar, Khyber Pakhtunkhwa, Pakistan
[3]Department of Physiology, Nowshera Medical College, Nowshera, Khyber Pakhtunkhwa, Pakistan
[4]Department of Forensic Medicine, Nowshera Medical College, Nowshera, Khyber Pakhtunkhwa, Pakistan
[5]Institute of Basic Medical Sciences, Khyber Medical University, Peshawar, Khyber Pakhtunkhwa, Pakistan
[6]Department of Community Medicine, Nowshera Medical College, Nowshera, Khyber Pakhtunkhwa, Pakistan
Correspondence to Prof. Dr. Muhammad Ishtiaq; Email: drishtiaq250@yahoo.com Cell No: 0334-9121822

ABSTRACT

Aim: To estimate the burden of non-communicable diseases and to assess the dietary pattern along with important relevant determinants among adult population of district Kohat & Nowshera Khyber Pukhtunkhwa Pakistan
Study Design: A descriptive cross sectional study
Place & Duration: This study was conducted in Kohat & Nowshera Districts of Khyber Pukhtunkhwa Pakistan; from June to December 2022.
Methodology: A total of n=385 male adults was selected and a structured questionnaire was used to collect relevant information regarding demographic, dietary, behavioral determinants. Finally data was analyzed and presented in form of text and tables.
Results: Results showed that 55.71% had age above 37 years; 28.31% were illiterate; 25.71% had monthly income more than 45000/ PKR; 60.78% were married; and 82.08% were employed. Moreover, 30.39% were current tobacco smoking; and 24.68% had positive history of past tobacco smoking. Furthermore, 44.94% prefer high caloric; 40.78% vegetables; 45.19% meat; 63,38% fresh fruits; and 18.70% & 21.30% prefer too much sugar and salt in food respectively. Furthermore; hypertension, malnutrition, eye problems and cancer were found among 22.60%, 59.74%, 7.01% & 2.08% respectively.
Conclusions: It was concluded that common non-communicable diseases were present in the studied male adults and showed strong relationship with dietary pattern along with demographic, epidemiological and socio-economical determinants. Moreover, effective and efficient policies and strategies were needed to reduce the double burden of non-communicable disease and its associated complications.
Keywords: Prevalence, Determinants, Diet, Vegetables, Overweight, Obesity, Tobacco, Adults

INTRODUCTION

Globally, non-communicable diseases are the leading causes of disease burden, and according to WHO statement, are responsible for 71% deaths globally[1]. The biggest threat to public health in the twenty-first century has continued to be non-communicable, and a systematic review among Eastern Mediterranean countries showed that the prevalence of multimorbidity too is increasing[2]. Moreover, NCDs results in ill health, mortality, and disability as well as economic loss, loss of life, declining living standards, and poor social development[3].

According to the Taiwan Food-Guide recommendations, people are advised to consume daily 3-5 servings of vegetables and 2-4 servings of fruit[3]. Vegetables and fruits contain a large number of vitamins, minerals, and dietary fiber[4].

Diet is considered a modifiable risk factor for NCDs and the nutrition transition had strong significant association with NCDs[5]. Obesity and obesity-related comorbidities have become an epidemic in the world[6]. The prevalence of obesity and overweight has continuously risen since 2010. Many international studies had revealed that raised blood pressure (BP), blood glucose and cholesterol level, along with overweight and obesity have been identified as main determinants of NCDs[7]. Moreover, processed and ultra-processed foods dramatically increased over the past two centuries, especially sugar, white flour, white rice, vegetable oils, and ready-to-eat meals and results in rising incidence of NCDs[8].

According to WHO, NCDs are globally the leading cause of death[9,10] & are considered as one of the highest priority public health challenges for countries with nutrition, epidemiological, demographic and geographical transition[11]. Moreover, the main determinants of NCDs are unhealthy diets, and sedentary behavior[9]. Increased age, Malnutrition, low education level,

----

urbanization, tobacco smoking, living in slums[12], physical inactivity, and consuming unhealthy food habits important determinants of NCDs[12]. Therefore low socioeconomic status, low consumption of fruits and vegetables along with urbanization coupled with economic growth, have led to a shift in the dietary pattern of many countries with increased caloric intake, and decreased diet quality[12].

According to a study conducted by Suri et al., 2019; found that globally the total diabetes mellitus cases are around 592 million[12]. Moreover, a study conducted by Center of Diseases Control, revealed highest prevalence of smoking and its related cancers[13]. Furthermore, neoplasms constituted the second leading cause of death globally and annually there are approximately 1·19 million new cancer cases[14].

Globally around 3 million deaths were attributed to increased NaCl consumption and is an important determinant of cardiovascular diseases and stroke[15]. Moreover, worldwide prevalence of blindness was 0.85% and the main causes are cataract (57.6%); glaucoma (16.7%); low vision (2.9%) and visual impairment (3.8%). Furthermore, glaucoma is the leading cause of blindness and affects 4.13 million adults[16].

Pakistan being a developing country has high prevalence of communicable and non-communicable diseases and persistence of important determinants of non-communicable diseases. Therefore this cross sectional study was conducted to estimate the true burden of NCDs and to assess the dietary pattern and it relevant determinants among the adult population of district Kohat & Nowshera Districts of Khyber Pukhtunkhwa Pakistan.

MATERIALS & METHODS

After ethical approval, a descriptive cross sectional study was conducted in among the selected districts of Kohat & Nowshera, Khyber Pukhtunkhwa Pakistan; from June to December 2022. Based on 95% confidence interval, 5% absolute precision and 50%

prevalence, the total sample size estimated was 384. Thus a total of n=385 male adults above age 18 years were selected among the two districts using a consecutive sampling technique.

Study Protocol: Regarding the demographic, nutritional and behavioral factors, a structured questionnaire was used to collect data and in face to face interview was conducted to collect relevant anthropometric assessment. Thus information on socio-demographics, lifestyle, dietary pattern, and health-related non-communicable diseases were collected from selected rural and urban communities of districts Kohat and Nowshera. For non-communicable diseases assessment; standard protocol was utilized i.e. systolic BP more than 140mmhg was labeled as hypertensive; Random blood sugar more than 180mg% was labeled as diabetes mellitus; BMI less than 19 was underweight; BMI more than 25 was labeled as overweight and obese. Moreover, for other NCDs direct questions regarding the non-communicable disease were asked from the participants. Furthermore, regarding the dietary pattern, help from the DASH Diet was taken, that has fruits, vegetables and low-fat dairy foods along with red-meat, grains, fish, chicken and carbohydrates. Finally data was analyzed and presented in form of tables.

RESULTS

Table 1: Demographic & Social Determinants of Adult Population of Kohat and Nowshera Districts Khyber Pukhtunkhwa (n=385)

Variable	Response	Frequency	%age
Age in years	18- 27 years	118	30.65
	28- 37 years	91	23.64
	38- 47 years	109	28.31
	> 47	67	17.40
Marital status	Married	234	60.78
	Unmarried	151	39.22
Body mass index	Undernourished	37	9.61
	Normal BMI	155	40.26
	Overweight	118	30.65
	Obese I II III	75	19.48
Education status	Illiterate	109	28.31
	Literate	276	71.69
Monthly income pkr	< 15000	79	20.52
	15000 - 30000	156	40.52
	30000 - 45000	51	13.25
	> 45000	99	25.71
Residential setup	Rural	283	73.51
	Urban	102	26.49
Employment status	No Job	69	17.92
	Has Job	316	82.08
Current tobacco smoking status	Yes	117	30.39
	No	268	69.61
If no, smoked in past	Yes	95	24.68
	No	173	44.94
Physically active/doing exercise	Yes	151	39.22
	No	234	60.78
Any acute disease	Yes	32	8.31
	No	353	91.69
Any chronic disease	Yes	95	24.68
	No	290	75.32
Any acute disease in family	Yes	79	20.52
	No	306	79.48
Any chronic disease in family	Yes	123	31.95
	No	262	68.05

Table 2: Dietary pattern frequency among adult population of Kohat and Nowshera Districts Khyber Pukhtunkhwa Pakistan (n=385)

Variable	Response	Frequency	%age
Prefer vegetables	Yes	157	40.78
	No	228	59.22
Frequency of vegetables	Daily	58	15.06
	2-3 Per Week	95	24.68
	Weekly	109	28.31
	Monthly	123	31.95
Prefer high caloric diet	Yes	173	44.94
	No	212	55.06
Frequency of high caloric diet	Daily	41	10.65
	2-3 Per Week	69	17.92
	Weekly	113	29.35
	Monthly	162	42.08
Prefer fresh fruits	Yes	244	63.38
	No	141	36.62
Frequency of fresh	Daily	65	16.88

fruits	2-3 Per Week	93	24.16
	Weekly	126	32.73
	Monthly	101	26.23
Prefer meat	Yes	174	45.19
	No	211	54.81
Frequency of meat	Daily	37	9.61
	2-3 Per Week	82	21.30
	Weekly	117	30.39
	Monthly	149	38.70
Like salt in food	Yes	252	65.45
	No	133	34.55
Prefer too much sugar	Yes	72	18.70
	No	129	33.51
Like sugar in food?	Yes	201	52.21
	No	184	47.79
Prefer too much salt	Yes	82	21.30
	No	170	44.16
Like dry fruits	Yes	129	33.51
	No	256	66.49

Table 3: Frequency of non- communicable diseases among adult population of Kohat and Nowshera Districts Khyber Pukhtunkhwa (n=385)

Particulars of NCDs	F	%age
CVDs/ CVAs	29	7.53
Hypertension	87	22.60
Diabetes Mellitus	51	13.25
Mental Illnesses	37	9.61
Malnutrition/ Under & Over nutrition	92	59.74
Blindness/ Cataract/Glaucoma/Low Vision	27	7.01
Liver & Kidney Diseases	58	15.06
Bone & Joint Diseases	107	27.79
Cancer	8	2.08

DISCUSSIONS

In our study, approximately 54.29% of participants has age been 18 to 38 years; whereas in a study conducted by Abd Al-Badri *et al.*, 2017; had 45.8% participants with age range of 18 to 40 years[17]. Moreover, in our study, 28.31% of adults were illiterate whereas in a study conducted by[11]; revealed that only 15.9% were illiterate; as shown in Table 1.

In a study conducted by Abd Al-Badri *et al.*, 2017; found that 20.6% had very low per capita income as was confirmed and supported by our study with 20.52% of participants had monthly income of < PKR: 15000/-[17]. Moreover, in our study, 73.51% were from rural setup whereas in study of Abd Al-Badri *et al.*, 2017; showed that only 21.9% were from rural areas[17].

According to our study, 30.39% were currently smoking tobacco whereas international studies; revealed 24.4%; 36.12% and 17% respectively[11,17,18]. Moreover, in study of Abd Al-Badri *et al.*, 2017; found that 15%, 35.5%, 20.2%, 62%, and 21.9% in Morocco, Lebanon, Saudi Arabia, Syria and Iraq respectively[17]. Furthermore, in studies conducted internationally by de Visser et al., 2021; and Bista et al., 2021; revealed that 58% and 7.4% of participants were physically inactive[19,18]; whereas in our study, 60.78% were inactive; and thus our findings were consistent and supported the findings of de Visser et al., 2021 and very high prevalence as compared to Bista et al., 2021[19,18]. Moreover, in study of Tatah et al., 2021; showed that globally and in Africa approximately 28% & 18% were physically inactive[20].

In our study, 40.26% had normal BMI; 9.61% were underweight; 30.65% overweight & 19.48% obese; whereas in studies conducted internationally showed 14.06 % overweight; and 12.64% obese[21]. Moreover, in study of Khorrami et al 2020; showed 36.6% and 14.9% respectively[11]. Thus our study findings were nearly consistent with study of Khorrami et al., 2020[21] and high as compared to Zhai et al., 2017 study[11] as shown in Table 2.

In our study, 40.78% like vegetables; 63.38% like juicy fruits; 45.19% meat; and 33.515 dry fruits; whereas in studies conducted internationally found 20% and 30.8% preference for vegetables[19,3]. Moreover, in study of Al Mawali et al., 2021; 61% didn't prefer vegetables[22]; 20% & 19.5% prefer juicy fruits in studies of de Visser et al., 2021; and Pan et al., 2018[19,3]. Furthermore, in our study; 15.06% had daily intake of vegetables and in study of Kirk et al., 2019; showed 18% prevalence[4]. Thus our study reports were

consistent with Al Mawali et al., 2021 study regarding prevalence of vegetables intake[22].

In our study, 65.45% like salt in food as was found in study of Clermont et al., 2022; which showed 87% prevalence[5]. Moreover, our study findings were consistent with Ghimire et al., 2021; by not preferring salt in food[15].

Among the participants; 7.53% had cardio-vascular diseases; whereas in studies of Di Renzo et al., 2018; had 48%[23] and Khorrami et al., 2020, had 1.6% CVDs[11]. Moreover, in our study, 22.60% had hypertension; whereas in studies of Yang et al., 2022; Al Mawali et al., 2021; and Khorrami et al; 2020; showed 18.8%; 33% and 16.9% of hypertension respectively[24,2,22,11]. Furthermore, in study of Ghimire et al., 2021; showed 13-16%, 15-19%, 19-27%, 22-34% and 24% among Bangladesh, Pakistan, Sri Lanka, Nepal and Bhutan respectively[15]; as shown in Table 3.

In studies of Schweda et al., 2022; Yang et al., 2022; and Khorrami et al., 2020; had 10%; 7.9%; and 6.5% of diabetes mellitus[24,2,11], while in our study it was 13.25%. Moreover, in studies conducted internationally showed 6.07%; and 0.2% prevalence of blindness, cataract, glaucoma and low vision whereas in our study about 7.01% had eye problems[16]. Furthermore, in our study, 27.79% had Musculo-skeleton problems whereas in study of Khorrami et al., 2020; showed that only 9.2% had such presentations[11].

CONCLUSIONS & RECOMMENDATIONS

From our results, it was concluded that the selected non-communicable diseases were observed and showed prevalence according to the national frequency. Moreover, non-communicable diseases among male adults showed strong relationship with demographic, epidemiological, socio-economical, nutritional and behavioral determinants and thus adequate effective and efficient policies and strategies were needed to control and prevent non-communicable diseases among adults and to reduce its associated complications.

Conflicts of interest: The authors declare no conflict of interest
Funding: There was no source of funding for the planned research study
Ethical Approval: The ethical approval was taken from the Ethical Review Committee of the Nowshera medical college Nowshera.

REFERENCES

1. M. A. Rahman, "Socioeconomic inequalities in the risk factors of noncommunicable diseases (hypertension and diabetes) among Bangladeshi population: Evidence based on population level data analysis," *PLoS One*, vol. 17, no. 9 September, 2022, doi: 10.1371/journal.pone.0274978.
2. C. Yang *et al.*, "Healthcare resource utilisation for chronic kidney disease and other major non-communicable chronic diseases in China: A cross-sectional study," *BMJ Open*, vol. 12, no. 1, 2022, doi: 10.1136/bmjopen-2021-051888.
3. W. H. Pan *et al.*, "Vegetable, fruit, and phytonutrient consumption patterns in Taiwan," *J. Food Drug Anal.*, vol. 26, no. 1, pp. 145–153, 2018, doi: 10.1016/j.jfda.2016.12.015.
4. B. Kirk, B. Melloy, V. Iyer, and L. M. Jaacks, "Variety, Price, and Consumer Desirability of Fresh Fruits and Vegetables in 7 Cities around the World," *Curr. Dev. Nutr.*, vol. 3, no. 9, pp. 1–6, 2019, doi: 10.1093/cdn/nzz085.
5. A. Clermont *et al.*, "Dietary Risk Factors for Cardiovascular Disease among Low-Income Haitian Adults: Findings from a Population-Based Cohort," *Nutrients*, vol. 14, no. 4, 2022, doi: 10.3390/nu14040787.
6. B. M. Popkin and S. W. Ng, "The nutrition transition to a stage of high obesity and noncommunicable disease prevalence dominated by ultra-processed foods is not inevitable," *Obes. Rev.*, vol. 23, no. 1, pp. 1–18, 2022, doi: 10.1111/obr.13366.
7. L. J. Dominguez, G. Di Bella, N. Veronese, and M. Barbagallo, "Impact of mediterranean diet on chronic non-communicable diseases and longevity. Nutrients. [revista en Internet] 2021 [acceso 10 de setiembre de 2021]; 13(6): 2028," *Nutrients*, vol. 13, no. 6, pp. 1–31, 2021, [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8231595/pdf/nutrients-13-02028.pdf
8. W. Geidl, K. Abu-Omar, M. Weege, S. Messing, and K. Pfeifer, "German recommendations for physical activity and physical activity promotion in adults with noncommunicable diseases," *Int. J. Behav. Nutr. Phys. Act.*, vol. 17, no. 1, pp. 1–13, 2020, doi: 10.1186/s12966-020-0919-x.
9. J. Williams, L. Allen, K. Wickramasinghe, B. Mikkelsen, N. Roberts, and N. Townsend, "A systematic review of associations between non-communicable diseases and socioeconomic status within low- and lower-middle-income countries," *J. Glob. Health*, vol. 8, no. 2, 2018, doi: 10.7189/jogh.08.020409.
10. D. C. Malta *et al.*, "Trends in mortality due to non-communicable diseases in the Brazilian adult population: National and subnational estimates and projections for 2030," *Popul. Health Metr.*, vol. 18, no. Suppl 1, pp. 1–14, 2020, doi: 10.1186/s12963-020-00216-1.
11. Z. Khorrami *et al.*, "The patterns of Non-communicable disease Multimorbidity in Iran: A Multilevel Analysis," *Sci. Rep.*, vol. 10, no. 1, pp. 1–11, 2020, doi: 10.1038/s41598-020-59668-y.
12. S. Suri *et al.*, "DASH Dietary Pattern: A Treatment for Non-communicable Diseases," *Curr. Hypertens. Rev.*, vol. 16, no. 2, pp. 108–114, 2019, doi: 10.2174/1573402115666191007144608.
13. T. Mahmudiono, C. Segalita, and R. R. Rosenkranz, "Socio-ecological model of correlates of double burden of malnutrition in developing countries: A narrative review," *Int. J. Environ. Res. Public Health*, vol. 16, no. 19, 2019, doi: 10.3390/ijerph16193730.
14. E. M. Alvarez *et al.*, "The global burden of adolescent and young adult cancer in 2019: a systematic analysis for the Global Burden of Disease Study 2019," *Lancet Oncol.*, vol. 23, no. 1, pp. 27–52, 2022, doi: 10.1016/S1470-2045(21)00581-7.
15. K. Ghimire *et al.*, "Salt intake and salt-reduction strategies in South Asia: From evidence to action," *J. Clin. Hypertens.*, vol. 23, no. 10, pp. 1815–1829, 2021, doi: 10.1111/jch.14365.
16. Y. Sun *et al.*, "Time trends, associations and prevalence of blindness and vision loss due to glaucoma: An analysis of observational data from the Global Burden of Disease Study 2017," *BMJ Open*, vol. 12, no. 1, pp. 1–6, 2022, doi: 10.1136/bmjopen-2021-053805.
17. H. J. Abd Al-Badri, M. A. Khaleefah Ali, A. A. Ali, and A. J. Sahib, "Socio-economic determinants of smoking among Iraqi adults: Data from Non-Communicable Risk Factor STEPS survey 2015," *PLoS One*, vol. 12, no. 9, pp. 1–11, 2017, doi: 10.1371/journal.pone.0184989.
18. B. Bista *et al.*, "Prevalence of non-communicable diseases risk factors and their determinants: Results from STEPS survey 2019, Nepal," *PLoS One*, vol. 16, no. 7 July, pp. 1–20, 2021, doi: 10.1371/journal.pone.0253605.
19. R. O. de Visser, D. Conroy, E. Davies, and R. Cooke, "Understanding Motivation to Adhere to Guidelines for Alcohol Intake, Physical Activity, and Fruit and Vegetable Intake Among U.K. University Students," *Heal. Educ. Behav.*, vol. 48, no. 4, pp. 480–487, 2021, doi: 10.1177/1090198120988251.
20. L. Tatah *et al.*, "Analysis of cameroon's sectoral policies on physical activity for noncommunicable disease prevention," *Int. J. Environ. Res. Public Health*, vol. 18, no. 23, 2021, doi: 10.3390/ijerph182312713.
21. L. Zhai, Y. Dong, Y. Bai, W. Wei, and L. Jia, "Trends in obesity, overweight, and malnutrition among children and adolescents in Shenyang, China in 2010 and 2014: a multiple cross-sectional study," *BMC Public Health*, vol. 17, no. 1, pp. 1–7, 2017, doi: 10.1186/s12889-017-4072-7.
22. A. Al-Mawali *et al.*, "Prevalence of risk factors of noncommunicable diseases in the Sultanate of Oman: STEPS survey 2017," *PLoS One*, vol. 16, no. 10 October, pp. 1–17, 2021, doi: 10.1371/journal.pone.0259239.
23. L. Di Renzo, G. Cioccoloni, P. S. Salimei, I. Ceravolo, A. De Lorenzo, and S. Gratteri, "Alcoholic beverage and meal choices for the prevention of noncommunicable diseases: A randomized nutrigenomic trial," *Oxid. Med. Cell. Longev.*, vol. 2018, 2018, doi: 10.1155/2018/5461436.
24. S. Schweda *et al.*, "Proof of Concept of a 6-Month Person-Oriented Exercise Intervention 'MultiPill-Exercise' among Patients at Risk of or with Multiple Chronic Diseases: Results of a One-Group Pilot Trial," *Int. J. Environ. Res. Public Health*, vol. 19, no. 15, 2022, doi: 10.3390/ijerph19159469