PREVALENCE OF NON-COMMUNICABLE DISEASES IN ADULT MEMBERS IN SELECTED WARDS OF KAGESHWORI MANOHARA MUNICIPALITY, KATHMANDU, NEPAL

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ABSTRACT

As non communicable diseases (NCDs) have now become a leading cause of morbidity and mortality with its burden rising more in the low income countries like Nepal, community based management of NCDs by mobilizing health workers from basic health service centers may give good results as well as reduce the load for the tertiary centers. For this generating data related to NCD in a particular locality is very important and this is scarce in Nepal which mainly relies on the data provided by the central government. A survey was done in 2 wards of Kageshwori Manohara Municipality of Kathmandu District, Nepal which is undergoing rapid urbanization, in the year 2023 and 2024 AD. This survey which included 2,900 adult participants in which around 1/4th had NCD. The prevalence of hypertension was 13% and diabetes 6.5% with diabetes more prevalent in *Brahmin* and *Chettri* caste. These locally generated data along with its use in managing the disease can also be used in raising health awareness in the local settings.

KEYWORDS

Kageshwori Manohara, Kathmandu, Nepal, non communicable disease, adults

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INTRODUCTION

Non-communicable diseases (NCDs), also known as chronic diseases, tend to be of long duration and are the result of a combination of genetic, physiological, environmental and behavioral factors. The main types of NCD are cardiovascular diseases, cancers, chronic respiratory diseases and diabetes. NCDs disproportionately affect people in low- and middle-income countries, where more than three quarters of global NCD deaths (31.4 million) occur.[1]

WHO estimates for deaths attributed to NCDs in Nepal have risen from 51% in 2010 to 60% in 2014.[2] A 2019 population-based nation-wide cross-sectional study in Nepal also indicated the high burden of NCDs with high prevalence of chronic obstructive pulmonary disease (COPD), diabetes, chronic kidney disease, coronary artery disease and diabetes which could pose a serious challenge to health systems in near future.[3] A community based cross sectional study done in 2 urban municipalities of Kathmandu District in 2019-20 AD showed that more than half of the participants were obese or overweight, which is itself a risk factor for other NCDs and more than a quarter of the participants had raised blood pressure.[4]

People with NCDs require long-term care that is patient-centered and sustainable. Such care can be delivered equitably only through health systems based on primary health care as it is no longer feasible to manage all the NCDs through specialists or in tertiary hospitals. The volume of patients has the potential to overwhelm such referral levels services and result in high costs to both the health system and to individuals.[5,6] Evidence from low- and middle-income countries have shown that mobilizing trained community health workers can be effective in managing non communicable diseases in the community through health education, early detection and lifestyle interventions in the community level. However, lack of recording and reporting system at the local level is one of the challenges faced by the healthcare system of Nepal.[7]

Hence it is very important that data on non-communicable diseases of people residing in different parts of Nepal is available at the basic health centres, which is the simplest unit of National Health care delivery system of Nepal and has made basic health services easily accessible to households of the ward. A ward is the simplest administrative unit of Nepal and has one or more Basic Health Centers depending upon the population density of the ward.

Kageshwori Manohara is an urban municipality and one of the 753 local units (Municipalities/ *Palikas*) of Nepal. It has 9 wards with total population of 1,30,433 with 68.5% of the total population in the adult age group i.e. more than 19 years of age. At present there are 6,743 wards in Nepal. Lying in foothills of Kathmandu Valley, Kageshwori Manohara is one of the municipality undergoing rapid urbanization as evident from it being the municipality of Nepal with highest growth rate of 7.4 percent.[8] Ward 2 and 3 of Kageshwori Manohara Municipality, which were previously Alapot Village Development Committee and Bhadrabas Village Development Committee, respectively were merged with other nearby located local units to form an urban municipilaty in December 2014. For this study these two wards were used.

As NCDs can develop from early adulthood, surveys to find out the prevalence of NCDs in wards of a municipality can help in monitoring the disease progression and preventing complications in community level. The findings of the survey in a particular locality can also be used for health education purposes as well as implementing community based intervention programs.

MATERIALS AND METHODS

After getting ethical approval from the Institutional Review Committee of Nepal Medical College (NMC) (Ref. No. 19-080/081) and the ward offices 2 and 3 of Kageshwori Manohara Municipality, which were selected as per convenience, data related to NCDs in adults residing those wards was collected. As this data collection is a part of community diagnosis program of MBBS and BDS students of NMC, permission was also taken from the Head of Department of Community Medicine, of the college for the use of this data in this research. Data was collected from Ward-3 in September 2023 and Ward-2 in April 2024. The households were selected based on the willingness of its members to give the information and help was also taken from the health volunteers of that area. According to the Census 2021, the total population of adults (above 19 years) in ward 2 and 3 is 2,494 and 2,257, respectively. The number of participants in this study was 1,468 from 431 families in ward 2 which is 59.0% of the total adult population in that ward. Similarly, it was 1,432 from 415 families which is 63% of the total adult population Ward-3. So the total number of adult participants in this study was two thousand and nine hundred. The NCD of adult members documented in this survey is based on self-reporting or reporting by their

family members. COPD and bronchial asthma has been put under chronic respiratory disease (as per WHO). Data was entered and analyzed using SPSS-16 and the level of significance was set at 0.05.

RESULTS

As can be seen from Table 1, majority of the participants in both the wards belonged to *Chettri* caste (around 40%) followed by *Brahmins* (around 30%). Interestingly, almost 18% of the 431 families from Ward-2 had "*Phuyal*" as their surname, which belongs to *Brahmin* caste, and almost 74% of the 415 families from Ward-3 had "*Pudasaini*" as their surname, which belongs to *Chettri* caste.

Table 1. Sociodemographic profile of the study participants of the two adjacent wards of Kageshwori Manohara Municipality

	Ward-2 n (%)	Ward-3 n (%)	Both wards n (%)
Caste/Ethnicity			
Chhetri	550 (37.5)	605 (42.2)	1155 (39.8)
Brahmin	444 (30.2)	512 (35.8)	956 (33.0)
Newar	297 (20.2)	156 (10.9)	453 (15.6)
Tamang	60 (4.1)	69 (4.8)	129 (4.5)
Dalit	78 (5.3)	36 (2.5)	114 (3.9)
Others	39 (2.7)	54 (3.8)	93 (3.2)
Age group in years			
20-30	429 (29.2)	411 (28.7)	840 (29.0)
31-40	374 (25.5)	304 (21.2)	678 (23.4)
41- 50	275 (18.7)	284 (19.8)	559 (19.3)
51-60	195 (13.3)	204 (14.3)	399 (13.6)
61-80	173 (11.8)	191 (13.3)	364 (12.6)
>80	22 (1.5)	38 (2.7)	60 (2.1)
Gender			
Male	719 (49.0)	699 (48.8)	1418 (48.9)
Female	749 (51.0)	733 (51.2)	1482 (51.1)
Total	**1468 (100.0)**	**1432 (100.0)**	**2900 (100.0)**

Majority of the adults participating in this study belonged to the age group 20-30 years of age (around 29%) followed by the age group 31-40 years of age (26% in ward 2 and 21% in ward 3) in both the wards. Those above 60 years of age constituted to almost 15% of the total subjects and around 2% of the population were above 80 years of age. Male to female ratio in the study participants was near to 1 in both the wards.

As can be seen from the table 2, around 1/4th of the participants had at least one NCD. There is no significant differences in the prevalence of common NCDs in the two wards. The most common NCD is hypertension, (12.3% in ward 2 and 13.9% in ward 3) followed by diabetes, 6.9% in Ward-2 and 6.1% in Ward-3. Thyroid disorder is the third most common NCD, 2.5% in Ward-2 and 3.2% in Ward-3. This was followed by chronic respiratory disease. Out of the 10 cases of cancer from the two wards, the common cancer amongst males was lung cancer and amongst female was uterine cancer.

Table 3 and Fig. 1 shows that the prevalence of HTN in specific adult age groups is seen to be rising with increase in age with 0.8% in the age group 20-30 years of age and 43.5% in the age group above 70 years of age. For diabetes, there is rise in the prevalence from 0.1% in the age group 20 to 30 years of age to almost 20% in the age group 61 to 70 years of age followed by decline to 14% in the age group above 70 years of age. In case of adults having both HTN and diabetes the age specific prevalence is seen to increase with age from 0.1% in the age group 20- 30 years of age reaching 10% for age group 61 to 70 years and above 70 years of age.

Table 2: Common NCDs in the wards of Kageshwori Manohara Municipality

		Ward-2 (N-1468) n(%)	Ward-3 (N-1432) n(%)	Total (N-2900) n(%)	P value
	NCDs	**354 (24.1)**	**378 (26.4)**	**732 (25.2)**	
1	HTN	181 (12.3)	199 (13.9)	380 (13.1)	> 0.05
2	Diabetes	102 (6.9)	87 (6.1)	189 (6.5)	> 0.05
3	Thyroid disorders	35 (2.4)	44 (3.1)	79 (2.9)	> 0.05
4	Chronic respiratory disease	31 (2.1)	38 (2.7)	69 (2.4)	> 0.05
5	Heart disease	16 (1.1)	25 (1.7)	41 (1.4)	> 0.05
6	Cancer	5 (0.3)	5 (0.3)	10 (0.3)	> 0.05

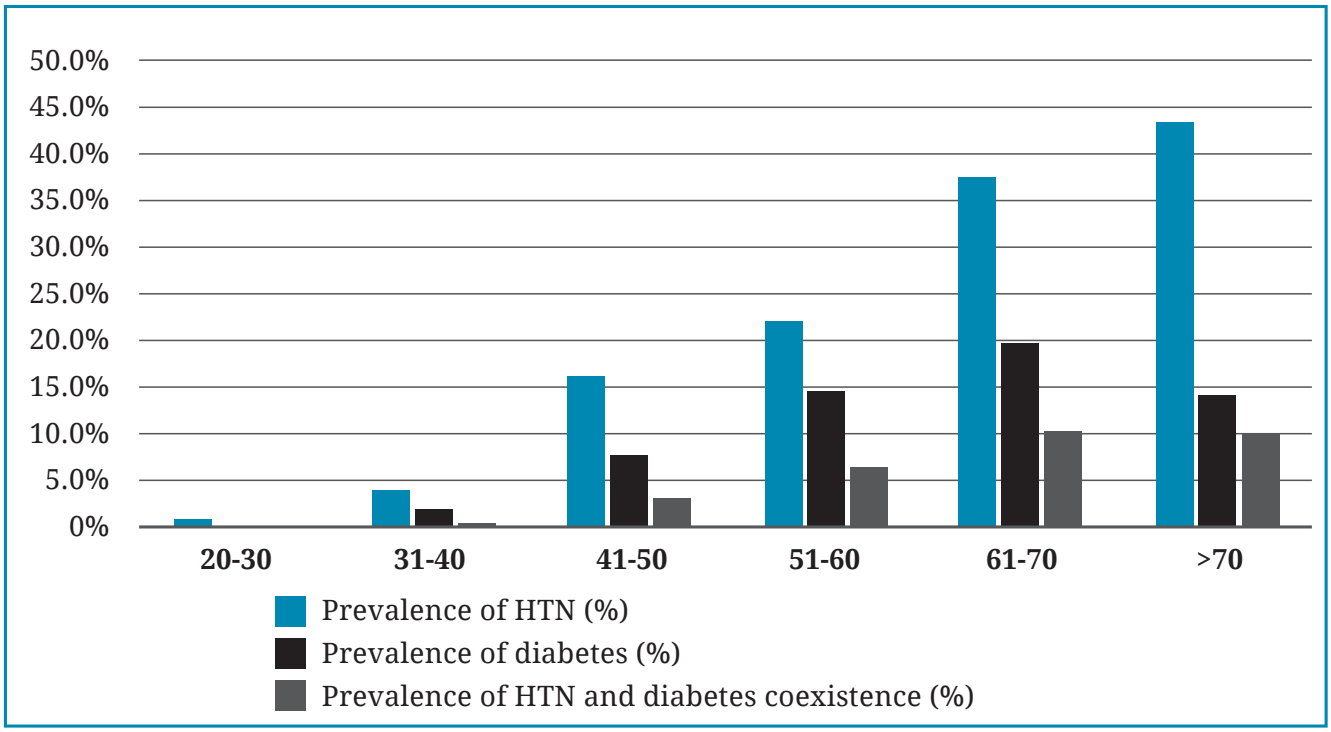

Fig. 1: Age group specific prevalence rates of HTN and diabetes and coexistence of both the diseases in 2 wards of an urban municipality (n=2900)

Table 3: Age specific prevalence of HTN and Diabetes patients in 2 adjacent wards of the urban municipality (n=2900)

Age groups (years)	Population (age group)	Numbers and prevalence in different age groups		
		HTN n (%)	Diabetes n (%)	Co-existence of both the conditions n (%)
20-30	840	7 (0.8)	1 (0.1)	1 (0.1)
31-40	678	26 (3.8)	13 (1.9)	3 (0.4)
41-50	559	90 (16.1)	43 (7.7)	17 (3.0)
51-60	399	88 (22.1)	58 (14.5)	25 (6.3)
61-70	254	95 (37.4)	50 (19.7)	26 (10.2)
>70	170	74 (43.5)	24(14.1)	17 (10.0)
Total	**2,900**	**380 (13.1)**	**189 (6.5)**	**89 (3.1)**

Table 4: Age and sex distribution of subjects with hypertension (n=380)

Age (years)	Male n (%)	Female n (%)	Total n (%)
20-35 (early adulthood)	8 (4.3)	7 (3.6)	15 (3.9)
36-65 (mid adulthood)	122 (65.2)	114 (59.1)	236 (62.1)
>65 (late adulthood)	57 (30.5)	72 (37.3)	129 (34.0)
	187 (100.0)	**193 (100.0)**	**380 (100.0)**

Table 5: Diabetes in *Brahmin/ Chettris* and *Adhibasi-Janajatis* (n=2758)

	Diabetes	No diabetes		P value	COR (95% CI)
Brahmin/Chettris	144 (6.8)	1967 (93.2)	2111 (100.0)	0.045	1.5 (1.0-2.2)
Adhibasi-Janajatis	30 (4.6)	617 (95.4)	647 (100.0)		

Table 6: Age and gender distribution of subjects with thyroid disorder (n=79) and chronic respiratory disease (n=69)

	Thyroid disorder n (%)	Chronic respiratory disease n (%)
Age groups in years		
26-30	2 (2.5)	1 (1.5)
31-40	11 (13.9)	2 (2.9)
41-50	21 (26.6)	5 (7.3)
51-60	27 (34.2)	11 (15.9)
61-70	11 (13.9)	29 (42.0)
>70	7 (8.9)	21 (30.4)
Gender		
Male	16 (20.3)	24 (34.8)
Female	63 (79.7)	45 (65.2)
Total	**79 (100.0)**	**69 (100.0)**

From Table 3 the number of patients of HTN, diabetes as well as those having both the diseases in each age group can be seen. The minimum age who were diagnosed as HTN was 28 years and there were 2 such cases. Age of the youngest person to be diagnosed as diabetes was a 30 years. Out of the total number of cases of HTN (380), the age group which constituted the highest number of cases was the age group 61 to 70 years of age which had 95 cases or 25.0% of the total cases. This was followed by the age group 41 to 50 years of age which with 88 which is around 23.0% of the total cases. Similarly, out of the total 189 cases of diabetes in the study participants, 58 were in the age group 51 to 60, (nearly 31.0% of the total cases), followed by 50 in the age group 61 to 70 years' age (around 24.0% of the cases). Out of 89 cases who had both HTN and diabetes, 26 were in the age group 61 to 70 years of age and 25 were in age group 51 to 60 years of age (around 29.0% of the total cases).

In Table 4, it can be seen that there were 187 male cases and 193 female diagnosed as having HTN which is around 50.0% of the total cases. For both males and the females, majority of the hypertensive patients belonged to mid adulthood group (62.0% for males and 59.0% for the females). This was followed by the late adulthood group in both males and the females (around 31.0% and 37.0% respectively). Less than 5.0% of the total person with HTN amongst the study participants belonged to the early adulthood group ie 20-35 years of age. From the Table 5, it can be seen that significant association is seen between diabetes prevalence and caste/ethnicity with higher prevalence in *Brahmin/Chettris* compared to the *Adhibasi-Janajatis*.

From the Table 6. It can be seen that out of the total 79 patients with thyroid disorder majority fall in the age group 51 to 60 years of age (34.0%) followed by the age group 41 to 50 which has almost 27.0% of the total patients. The number of such patients is almost 4 times in the females than in the males (almost 80.0% and 20.0% respectively). Similarly, for the patients with chronic respiratory disease, which is 69 in number, almost 3/4th are above 60 years of age. The number is also very high in females than in the males (65.0% versus 35.0%).

DISCUSSION

It was shown from this study that majority of the study participants belonged to *Chettri* caste, followed by *Brahmins* in both of the adjacent wards of Kageshwori Manohara Municipality. These two caste comprised of almost three fourth of the total adults included in the study. Interestingly, the surname *Pudasaini*, a *Chettri* caste comprised of almost the three fourths of the total households in ward 3 and surname "*Phuyal*", a *Brahmin* caste, comprised almost one fifth of the total families in Ward-2. *Brahmins* and *Chettris* have been put under "*Khasa*" caste because of their historical and cultural similarities.[9] Areas like these with clusters of certain caste groups can provide valuable information related to historico-ethnic studies of different places of Nepal, a country known for its cultural diversity.

Majority of the adults in this study belonged to the age group 20 to 40 years of age (around 50.0%), above 60 years of age constituted almost 15.0% and 2.0% of the participants were above 80 years of age. This age distribution is very much similar to the age distribution of Nepal according to Census 2021 which has shown that around 53.0% of the adult population falls under the age group of 20 to 39 years of age, around 16.0% of the adult population is 60 years and above and almost 2.0% of the adult population belonged to the age group 80 years and above. Sex distribution amongst the study participants is also similar to that of Nepal.[8] Healthcare needs of a population cannot be measured or met without the knowledge of its size and characteristics.[10] Hence, this type of information may be very useful while planning for health services in this locality.

Table 2 shows the common NCD's in the two adjacent wards of the municipality. The prevalence of the most common NCD amongst

the adults in this study, HTN, was shown to be around 13 percent. However, a systemic review and meta-analysis study in Nepal which identified 23 studies Nepal showed that the pooled prevalence of HTN for 2016-2020 AD ranged from 27.0% (95.0% CI: 19-34.0%) to 50.0% (95% CI: 30-69%). Looking at the rising trend in the prevalence of HTN, the same study has predicted that almost 45.0% of adults will suffer from HTN by the year 2025 AD.[11] Similarly, the prevalence of diabetes of around 6-7% shown by this study, though close to, is not in the 95.0% confidence interval of a population-based study involving 13,200 participants aged 20 years and above from 400 clusters of 72 districts of Nepal which showed the prevalence of diabetes to be 8.5% (CI 95.0%: 7.8-9.3%).[12] Hence it can be seen that findings of a study carried out in a certain locality can be different from other studies carried out on a larger national scale. The reason could be that localities or other similar ones might not have been represented in the sample used in the national surveys.

The prevalence of chronic respiratory disease, which included both COPD and asthma, was shown to be 2.4% in this study. Different community based studies done in rural and urban settings of Nepal has shown wide range in the prevalence of COPD (1.7% to 14.6%) and bronchial asthma (4.2% to 8.9%).[13] A systematic review and meta-analysis on the prevalence of COPD in in India showed that it was 2.4% in Southern India and 16.1% in Northern India. The study suggested that geographical variation could have played a role in varying prevalence of COPD in different parts.[14] As the country Nepal is well known for its geographical diversity it is important that there is study on disease on different geographical settings. Data related to a particular disease in a place will also help in the community based management of the disease at the nation's simplest administrative unit, which is a ward by mobilizing health workers from basic health centers.

Studies related to thyroid disorders in Nepal is mainly hospital based but a community based study done in 5 districts of Nepal found that the prevalence of thyroid disorders to be 4.3 percent.[15] Kathmandu District, which is one of the 77 districts of Nepal and where where Kageshwori Manohara Municipality is located, has other 10 municipalities. In this study where the two adjacent lying wards of this municipality were surveyed, it was shown to be 2.9 percent. Hence health related studies done in different localities of Nepal may give a different picture than that provided by other larger studies.

It can be seen from Table 3 that out of all the cases of HTN and diabetes as well as co-existence of the both conditions, the proportion is almost 50.0% in age group 41 to 60 years of age. In the Fig. 1, data related to age specific prevalence rates of HTN, diabetes as well as both the conditions can be seen which shows rise in the proportion of cases along with age for HTN and similar pattern for diabetes up-to age interval 61-70 years, after which there is decline. In US, data from National Health and Nutrition Examination Survey done in 2017-18 also showed that hypertension increased with age: 22.4% (aged 18–39), 54.5% (40–59), and 74.5% (60 and over).[16] Another National Health and Nutrition Survey done in Korea in 2011 using nationally representing sample of 5,844 adults aged more than 20 years showed that diabetes prevalence increased with age.[17] Just like the data of these national surveys are used for national health planning, data obtained from research of certain locality can be used to know the disease distribution and pattern in different adult age groups in that particular area which can be further utilized to design community based health interventions for different age groups.

Another study carried out in the urban municipalities in the foothills of Kathmandu valley on the prevalence and risk factors associated with HTN (which also included wards of Kageshwori Manohara) in the year 2015 AD by Dhungana *et al*[18] has suggested for the effective community-based preventive and control strategies to avoid hypertension driven health and economic consequences in Nepal. For this, identifying the patients and their family members and knowing about the age and gender distribution of HTN in that particular area (as shown in Table 4) might be of great help which showed that the most commonly affected group was in the mid adulthood. With the availability of local data, the community health workers are able to deliver culturally appropriate and acceptable care, thereby addressing barriers to healthcare access and improving health outcomes among the patients in that particular area.

Epidemiological studies have been conducted in US on the role of ethnicity in diabetes and its related complications. The journal published in the year 2013 in this subject has shown that the prevalence was highest among Native Americans (33.0%) and lowest among Alaska natives (5.5%).[19] A hospital based study done in a medical college in Banke District, Lumbini Province of Nepal in the year 2019 showed that amongst the patients who visited the hospital during that time *Chhetri* caste had

highest diabetes prevalence (30.5%) followed by *Brahmin* (24.0%) and *Tharus* (16.5%) which is an ethnic group in mid and Western Terai of Nepal.[20] In this study , there was significant association between diabetes prevalence and caste/ethnicity with *Brahmin/Chhetri* group having higher odds of suffering from Diabetes compared to the *Adhibasi-Janajatis*, ie ethnic groups of Nepal as seen in Table 5. These type of analytical studies done in an area cohort removes bias due to geographical variation.

Table 6 shows the age and gender distribution of the other two common NCD, thyroid disorders and chronic respiratory diseases amongst the adults residing in the two wards of the urban municipality. Female preponderance for thyroid disorder which has been known from many decades back was also seen in this study.[21] A study done on the burden of COPD in Nepal using the data from Global Burden of Disease 2016 showed that the incidence and prevalence of COPD were high among males whereas the death rate and DALYs were more significant among females throughout the years.[22]In this study the prevalence of chronic respiratory disease was very high in females compared to the males (around 65.0% and 35.0% respectively). Such local data on different diseases can be useful for conducting community based disease specific studies or for planning for special health facilities, example the need for of a pulmonologist or endocrinologists.

Along with health surveys conducted at national/provincial level for NCDs there is need of surveys in different localities of a same country which may fill the inevitable gaps of the former type of surveys. Such survey can be carried out on wards of a Municipality. Basic health service centers present in Wards of Nepal, health unit present in the municipality office and academic institutions of the locality can play an important role in carrying out these types of surveys. The primary health care approach offers a common platform to effectively address NCDs through preventive and curative interventions, but its potential is not fully tapped in Nepal.[23] This would lessen the burden for the Federal government or associated bodies in Nepal in planning to manage health problems of people all over Nepal. At the same time, it can also help in bringing out the unique pattern of NCD in that area which has resulted due to environmental, social and cultural factors prevailing in that locality. Based on these findings more effective and locally acceptable interventions to overcome NCD burden can be introduced in that locality. This type of data will also be of help to the enrollment assistants who have been recruited from each ward by the Local governments to educate and enroll the people in National Health Insurance Program of Nepal.[24] Moreover, the geographical, cultural and socio economic diversity of Nepal makes it even more important that attempts should be made on gathering basic data on health issues of different places of Nepal, and that related to NCD is of immense importance for present time and situation.

LIMITATIONS: The wards and the households were selected as per convenience and the documented NCDs were based on reporting by the family members.

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REFERENCES

1. WHO. Available at: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases (Accessed on: May 2025)
2. Aryal KK, Mehta S, Neupane S *et al*. The burden and determinants of non communicable disease risk factors in Nepal: findings from a nationwide STEPS survey. *PLoS One* 2015; 10. DOI: 10.1371/journal.pone.0134834
3. Dhimal M, Karki KB, Sharma SK *et al*. Prevalence of selected chronic non communicable diseases in Nepal. *J Nepal Health Res Counc* 2019; 17: 394-401. DOI: 10.33314/jnhrc.v17 i3.2327
4. Dahal S, Sah RB, Niraula SR, Karkee R, Chakravartty A. Prevalence and determinants of non-communicable disease risk factors among adult population of Kathmandu. *PLoS One* 2021; 16: e0257037. DOI: 10.1371/journal.pone.0257037.
5. WHO. Package of essential noncommunicable (PEN) disease interventions for primary health care in low-resource setting. Geneva: World Health Organization; 2015.
6. WHO. Global action plan on the prevention and control of non-communicable diseases 2013–2020. Geneva: World Health Organization; 2013.
7. Rawal LB, Khanal C, Yadav UN *et al*. Community health workers for non-communicable disease prevention and control in Nepal: a qualitative study. *Brit Med J* 2020; 10: e040350.

8. Government of Nepal. National Statistical Office. National Population and Housing Census 2021.
9. Kafle DR. Indigenous *Khasa* people of Nepal in crisis. *Hist J* 2023; 14: 38-48.
10. Tulchinsky TH and Varavikova EA. Measuring, monitoring, and evaluating the health of a population. *New Pub Health* 2014: 91–147. DOI: 10.1016/B978-0-12-415766-8.00003-3.
11. Dhungana RR, Pandey AR, Shrestha N. Trends in the prevalence, awareness, treatment, and control of hypertension in Nepal between 2000 and 2025: a systematic review and meta-analysis. *Int J Hypertens* 2021; 2021: 11 pages. DOI: https://doi.org/10.1155/2021/6610649.
12. Shrestha N, Karki K, Poudyal A *et al*. Prevalence of diabetes mellitus and associated risk factors in Nepal: findings from a nationwide population-based survey. *BMJ Open* 2022; 12: e060750. DOI: 10.1136/bmjopen-2022-060750
13. Ekezie W, Jenkins AR, Hall IP *et al*. The burden of chronic respiratory diseases in adults in Nepal: a systematic review. *Chron Respir Dis* 2021: 1479973121994572. DOI: 10.1177/1479973121994572.
14. Daniel R, Aggrawal P, KalaivaniM, Gupta SK. Prevalence of chronic obstructive pulmonary disease in India: a systematic review and meta-analysis. *Lung India* 2021; 38: 506-13
15. Lamichhane S, Acharya SK, Lamichhane P. Iodine deficiency and thyroid dysfunction: Current scenario in Nepal. *Ann Med Surg* 2022; 82: 104673. DOI: 10.1016/j.amsu.2022.104673
16. Ostchega Y, Fryar CD, Tatiana N, Nguyen DT. Hypertension prevalence among adults aged 18 and over : United States, 2017–2018: 2020. NCHS data brief 364.CDC
17. Kim SM, Lee JS, Lee J *et al*. Prevalence of diabetes and impaired fasting glucose in Korea: Korean National Health and Nutrition Survey 2001. *Dia Care* 2006; 29: 226–31. DOI: https://doi.org/10.2337/diacare.29.02.06.dc05-0481
18. Dhungana RR, Pandey AR, Bista B, Joshi S, Devkota S. Prevalence and associated factors of hypertension: a community-based cross-sectional study in municipalities of Kathmandu, Nepal. *Int'l J Hypertens* 2016; 2016: 1656938. DOI: 10.1155/2016/1656938.
19. Spanakis EK, Golden SH. Race/ethnic difference in diabetes and diabetic complications. *Curr Diab Rep* 2013; 6: 814-23. DOI: 10.1007/s11892-013-0421-9.
20. Shankhadev A, Shrestha GP, Khadka D, Shrestha A, Shrestha A. To study the prevalence and the risk factors of diabetes mellitus in patients attending a tertiary center of Nepal. *Curr Res Diab Obes J* 2024; 17: 555970. DOI: 10.19080/
21. Chiovato L, Lapi P, Fiore E *et al*. Thyroid autoimmunity and female gender. *J Endocrinol Invest* 1993 ;16: 384–91. DOI: https://doi.org/10.1007/BF03348863
22. Adhikari TB, Neupane D, Kallestrup P. Burden of COPD in Nepal. *Int J Chron Obstruct Pulmon Dis* 2018; 13: 583–9. DOI: https://doi.org/10.2147/COPD.S154319
23. Gyawali B, Khanal P, Mishra SR, van Teijlingen E, Wolf Meyrowitsch D. Building strong primary health care to tackle the growing burden of non-communicable diseases in Nepal. *Glob Health Action* 2020; 13: 1788262. DOI: 10.1080/16549716.2020.1788262.
24. Khanal GN, Bharadwaj B, Upadhyay N *et al*. Evaluation of the National Health Insurance Program of Nepal: are political promises translated into actions? *Health Res Policy Sys* 2023; 21: 7. DOI: https://doi.org/10.1186/s12961-022-00952-w