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The Impact of Noncommunicable Diseases on Health and Daily Functioning Among Middle-Aged and Older Adults in Türkiye

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Abstract

Noncommunicable diseases (NCDs) are recognised as a significant public health concern for developing countries. Since exposure to NCDs increases with age, older adults are particularly at risk. This study evaluated the association between NCDs and health status variables among middle-aged and older adults in Türkiye, a developing country. Participants were community-dwelling middle-aged and older adults (N = 7,889, Age≥ 45+) who participated in the Türkiye Health Survey, a cross-sectional study. The effects of NCDs on perceived health status, activities of daily living (ADLs) and instrumental activities of daily living (IADLs) were examined. The NCDs of stroke, kidney problems, depression, coronary heart disease, low back disorder, and multimorbidity was associated with higher likelihood of experiencing very poor/poor self-perceived health status and of limiting ADLs and IADLs. NCDs was negatively associated with the functional health of middle-aged and older adults. In light of the aforementioned considerations, it is essential to implement measures that support the vital activities of these individuals and enhance their overall health status.

Keywords

Cardiovascular diseases, self-perceived health status, activities of daily living, adults, multimorbidity

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El Impacto de las Enfermedades No Transmisibles en la Salud y el Funcionamiento Diario de los Adultos de Mediana Edad y Mayores en Turquía

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Resumen

Las enfermedades no transmisibles (ENT) son reconocidas como un importante problema de salud pública en los países en desarrollo. Dado que la exposición a las ENT aumenta con la edad, los adultos mayores están particularmente en riesgo. Este estudio evaluó la asociación entre ENT y las variables de estado de salud en adultos de mediana edad y mayores en Turquía, un país en desarrollo. Los participantes fueron adultos de mediana edad y mayores que viven en la comunidad (N = 7889, Edad = ≥ 45+) que participaron en la Encuesta de Salud de Turquía, un estudio transversal. Se examinaron los efectos de las ENT en el estado de salud percibido, las actividades de la vida diaria (AVD) y las actividades instrumentales de la vida diaria (AIVD). Las ENT de accidente cerebrovascular, problemas renales, depresión, enfermedad coronaria, trastornos de la columna lumbar y multimorbilidad aumentaron la probabilidad de experimentar un estado de salud autopercibido muy deficiente/pobre y de limitar las AVD y las AIVD. Las ENT se asociaron negativamente con la salud funcional de los adultos de mediana y avanzada edad. Por ello, es fundamental implementar medidas que apoyen sus actividades vitales y mejoren su estado de salud.

Palabras clave

Enfermedades cardiovasculares, estado de salud autopercibido, actividades de la vida diaria, adultos, multimorbilidad

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Thanks to advances in healthcare over the past century, infectious diseases have declined, while noncommunicable diseases (NCDs) have become a leading health concern (World Health Organization, 2008; US Department of Health and Human Services). The countries with the highest risk in terms of NCDs are considered to be underdeveloped and developing countries (United Nations, 2011; World Health Organization, 2017a). NCDs are defined as noncommunicable medical conditions or chronic diseases that are caused by genetic, physiological, environmental and/or behavioural factors, usually long-term and slowly progressing but can be fatal in a short period (World Health Organization, 2018). NCDs include cardiovascular diseases (e.g. stroke, coronary heart disease, myocardial infarction), diabetes, chronic respiratory diseases (e.g. COPD, asthma), cancer, mental health disorders (e.g. depression), musculoskeletal disorders (e.g. back and neck pain), and kidney disease (World Health Organization, 2023).

Each year, 41 million people die from NCDs, representing 74% of global deaths, with the majority occurring in low- and middle-income countries (World Health Organization, 2023). Cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes account for 80% of these deaths. Türkiye, as a developing country, faces a growing NCD burden, with 87.5% of all deaths attributed to NCDs and a 17% risk of premature death (World Health Organization, 2017b; Institute for Health Metrics and Evaluation, 2024).

The increase in the prevalence of NCDs is due to many behavioural, metabolic, and environmental factors (Murray et al., 2020). It is explained that the prevalence of NCDs and NCD-related deaths will increase as the population ages, especially due to decreasing fertility rates and increasing life expectancy (Gyasi & Phillips, 2020). Although NCDs affect all age groups, they are reported to be more common, especially among middle-aged and elderly individuals (World Health Organization, 2018). In older adults, NCDs are associated not only with increased mortality but also with functional limitations, reduced mobility, increased care needs, and decreased capacity for independent living, all of which reduce quality of life (Bowling et al., 2019; Reis et al., 2023). The effects of NCDs, particularly on daily living activities such as ADL and IADL, directly impact older adults' dependence on the healthcare system and their participation in social life (Scheel-Hincke, Möller, Lindahl-Jacobsen, Jeune, & Ahrenfeldt, 2019).

NCDs are diseases that require long-term care, which increases healthcare expenditures and causes deterioration in the functional, psychological and cognitive health of patients (Ahmed, Muhammad, & Muneera, 2023). In a study investigating the association between NCDs and perceived health status in a large sample group in Brazil, it was found that individuals with NCDs were more likely to have poor perceived health status compared to others (Theme Filha, Souza Junior, Damacena, & Szwarcwald, 2015). In a study examining the association between NCDs and activities of daily living (ADLs) and instrumental activities of daily living (IADLs) in 4,217 individuals, it was found that NCDs limited the skills in ADLs and IADLs (Bowling et al., 2019). A study conducted on a large sample group in Brazil found that individuals with NCDs were more limited in performing ADLs and IADLs compared to those without NCDs (Reis et al., 2023). The results indicate that to avoid or mitigate the negative health consequences associated with NCDs, it is necessary to avoid either exposure to risk factors that cause NCDs or modify risk factor behaviours (Li, Fan, Wei, Yang, & Jiao, 2023). Although most of these studies conducted in different countries have found that similar NCD groups are

associated with functional limitations, there are differences in terms of sample structure and criteria used. For example, Bowling et al. (2019) measured ADL limitations based on self-reporting, while Wu et al. (2013) used objective validation.

NCDs are viewed as one of the barriers to the efficiency of health systems, alongside preventable readmissions, inadequate disease management, and communication barriers (Palladino, Tayu Lee, Ashworth, Triassi, & Millett, 2016). In this respect, measuring the impact of NCDs at the national level is crucial for clarifying the problem more clearly and developing practical solutions accordingly. Health service utilisation, health expenditure, and health status variables (perceived health status, ADLs and IADLs) have been widely used to assess the impact of NCDs at the national level (Natarajan & Nietert, 2004; Marengoni et al., 2011; Sum et al., 2019; Van Oostrom et al., 2014; Palladino et al., 2016; Agborsangaya, Lau, Lahtinen, Cooke, & Johnson, 2013). It is reported that studies evaluating the impact of NCDs at the national level can provide more information about the burden of NCDs on health resources, which can be used in planning and improving health services (Van Oostrom et al., 2014). In this context, this study aims to evaluate the effect of NCDs on middle-aged and elderly individuals aged 45 years or older who are at risk for NCDs in Türkiye, a developing country. The variables of perceived health status, ADLs, and IADLs were used to assess the impact of NCDs at the national level. It is reported that these health variables are widely used in studies conducted at the societal level (Heggenhougen & Quah, 2016). In Türkiye and worldwide, there are limited studies examining the effects of NCDs on the functional health of middle-aged and older individuals on a national scale. Existing studies have generally focused on specific diseases or regional samples.

Methods

Data Sources

The Turkish Health Survey (THS) dataset, a crucial data source compiled by TurkStat in 2019, was utilised to achieve the objective of this study. The primary aim of the study is to investigate the impact of NCDs on health status variables in Türkiye. Since the THS is conducted in a nationally representative manner, international comparisons can be made with the variables obtained, and national needs can be determined. THS includes data on individual characteristics, risk factors, NCDs, and perceived health status, as well as ADLs and IADLs health variables. The THS survey is implemented through face-to-face interviews with individuals in households and the data obtained are based on the statements of the interviewees (TurkStat, 2023).

Sample

The THS population consists of all households in Türkiye. Sampling in the survey is conducted in a way that allows the results to be generalised across Türkiye (TurkStat, 2023). Accordingly, 23,199 people were determined to be the THS sample in 2019. Since this study aims to evaluate

the effect of NCDs on health status variables in adults and elderly individuals aged 45 years or older, the study sample consists of 7,889 people.

Measures

Individual characteristics are important determinants of NCDs. According to studies conducted, age, gender, educational status, and marital status are reported to be determinants of NCDs (Ho et al., 2022; Nguyen et al., 2019). Accordingly, in this study, the variables of gender, age, education level, and marital status were selected as individual characteristics and included in the analysis.

Within the scope of this study, stroke, myocardial infarction, kidney problems, depression, COPD, coronary heart disease, asthma, diabetes, neck disorder or other chronic neck defect, and low back disorder or other chronic back defect listed in the THS were selected as NCDs. Additionally, the status of multimorbidity within NCDs was also evaluated. It was inferred that individuals with two or more of the NCDs selected within the scope of the study had multimorbidity, whereas those with one or fewer did not. In the THS, the question "Mr ..... have you experienced the disease in question in the last 12 months?" is asked and the answer "Yes" or "No" is obtained (TurkStat, 2023). As a result, it is decided whether the person has the specified NCD or not. There are studies that consider NCDs based on self-reporting by individuals and evaluate their impact on health status variables (Natarajan & Nietert, 2004; Palladino et al., 2016; Agborsangaya et al., 2013). There are studies that oppose the determination of having a disease based on the declaration of the person, as well as studies that find this method correct (Marengoni et al., 2011; Britt, Harrison, Miller, & Knox, 2008; Huntley, Johnson, Purdy, Valderas, & Salisbury, 2012). In a study comparing declaration-based disease status with physician examination, it was found that the declarations of individuals provided entirely accurate results (Kriegsman, Penninx, Van Eijk, Boeke, & Deeg, 1996). Several studies explained that the results based on self-reports are reliable and have both methodological and clinical value (Lorem, Cook, Leon, Emaus, & Schirmer, 2020; Shields & Shooshtari, 2001). Additionally, collecting health data based on individual declarations enables cost-effective data collection. It enables the collection of health data in larger sample groups (Hosseini et al., 2019; Ürek, Karaman, Bilgin, Uğurluoğlu, & Işık, 2023).

Health status variables include perceived health status, as well as ADLs and IADLs (TurkStat, 2023). The European Health Interview Survey also uses these health status variables to assess health status (Eurostat, 2020). A single question in the THS assesses perceived health status: "How is your health status in general?" and one of the answers, "Very good", "Good", "Fair", "Poor", or "Very poor", is obtained (TurkStat, 2023). In the studies conducted, the answers given to the perceived health status question were categorised into three groups: "Very good and Good", "Fair", and "Poor and Very Poor" (Samouda et al., 2019; Samouda et al., 2018). As in the previous studies, the answer options for perceived health status were grouped in this study.

ADLs and IADLs are among the important variables of health status and reveal the independence of individuals to fulfil daily vital activities. Difficulties in fulfilling ADLs and IADLs indicate that the individual requires assistance from another person and may lead to

social exclusion in various aspects of life (Berger et al., 2015). In THS, ADLs encompass activities such as moving in bed, transitioning between positions, ambulating or moving around, getting dressed, using the toilet, feeding oneself, washing, and maintaining personal grooming. IADLs encompass meal preparation, grocery shopping, performing light and heavy household chores, managing daily administrative tasks and financial affairs, using the phone, and handling medication (TurkStat, 2023). In the THS, individuals are asked whether they can do the aforementioned activities without assistance, and as a result, one of the answer options "No difficulty", "Some difficulty", "Very difficulty" or "Not at all" is obtained. In addition to these, there is an additional answer option for IADLs as "Not interested in this activity/not willing to do it" (TurkStat, 2023). The ADLs in the THS are based on the activities in the scale developed by Katz, Ford, Moskowitz, Jackson, & Jaffe, (1963), while the IADLs are based on the activities in the scale developed by Lawton & Brody (1969). Gaertner, Busch, Scheidt-Nave, & Fuchs, (2019) and Crevenna & Dorner (2019) reported that individuals who answered "Very difficult" or "Cannot do at all" for at least one ADLs or IADLs were limited in performing ADLs or IADLs, while those who gave other answer options were not limited in performing ADLs or IADLs. Accordingly, in this study, it was inferred that individuals who answered "Very difficult" or "Not at all" for at least one ADL or IADL were limited in their ability to perform ADLs or IADLs. In contrast, those who gave other answer options were not limited in performing ADLs or IADLs.

Covariates

Covariates, including individual characteristics and risk factors, were controlled in all regression models. The selected covariates are commonly used in studies on the determinants of health status variables and are necessary for more accurate estimates (Sum et al., 2019; Palladino et al., 2016; Natarajan & Nietert, 2004). Individual covariates controlled included gender, age, educational status, and marital status. Risk factors covariates included overweight/obese, insufficient physical activity, tobacco use, hypertension and alcohol consumption.

Data on overweight/obesity variable were obtained by calculating BMI. Those with a body mass index of 25 and above were defined as overweight/obese; those with a body mass index below 25 were defined as normal/underweight. In assessing physical activity status in the THS, the questions "When you are working/doing your daily activities, which of the options best describes your situation?" and "In a normal week, how much time do you spend doing sports, fitness or leisure time activities?" are used. It was decided that the physical activity level of individuals who answered "Mostly sitting or standing" to the aforementioned questions or whose duration of physical activities for health promotion was less than 150 minutes was "insufficient". Individuals who answered one of the questions "Mostly walking or work requiring moderate physical exertion" or "Mostly heavy work or work requiring physical exertion" or whose duration of physical activity for health promotion was more than 150 minutes were judged to have an "adequate" physical activity level. For hypertension, the question "Mr. ..... have you experienced the risk factor in question in the last 12 months?" is asked and "Yes" or "No" answers are obtained. For the tobacco use variable, the question "Do

you use tobacco products (cigarettes, rolled cigarettes, cigars, pipes, heated tobacco products, hookah, etc.)?" is asked and one of the answers "Yes, every day", "Yes, occasionally", "Never" or "I quit" is obtained (TurkStat, 2023). In the studies conducted by Richter et al. (2021) and Finger et al. (2019), tobacco use status was assessed using a similar question, but the answer options were grouped into two categories. Those who chose "Yes, every day" or "Yes, occasionally" were classified as "Tobacco users" and those who chose "Never" or "I quit" were classified as "Non-tobacco users". Although the negative impact of tobacco on health decreases over time in individuals who have quit, it is still reported to be at a high level compared to individuals who have never used tobacco (Critchley & Capewell, 2003; Canbakan, 2016). For this reason, in this study, those who answered "Yes, every day", "Yes, occasionally" or "I quit" to the variable of tobacco use status were classified as "Tobacco user/used"; those who answered "Never" were classified as "Non-tobacco user". Regarding alcohol consumption, the question "How often have you used alcoholic beverages in the last 12 months?" is asked and one of the options "Almost every day", "5-6 days a week", "3-4 days a week", "1-2 days a week", "2-3 days a month", "Once a month", "Less than once a month", "I did not drink in the last 12 months, I don't drink anymore", "I never drank in the last 12 months/I only drank/tried a few sips throughout my life" are selected (TurkStat, 2023). In the study conducted by Jimenez-Garcia et al. (2018), similar questions and answers were used to assess individuals' alcohol consumption status. It was inferred that those who answered "Almost every day", "5-6 days a week", "3-4 days a week", "1-2 days a week" or "2-3 days a month" were alcohol users; while those who selected other response options were non-alcohol users. This grouping was also used in this study to reveal the alcohol consumption status of individuals.

All variables used in the study, along with coding information related to these variables, are presented in Table 1. The selection of study variables was determined in accordance with the World Health Organisation's framework for active ageing and functional ability. In this context, health perceived and activities of daily living were considered as key indicators of health outcomes for older individuals.

Table 1

Information on Variables Used in the Study

Variable Name	Coding
Individual Characteristics	
Gender	1 = Female 2 = Male
Age	1 = 45–54 2 = 55–64 3 = 65–74 4 = 75+
Educational Status	1 = Illiterate 2 = Didn't finish a school/Primary school 3 = Secondary school 4 = High school 5 = Associate degree/Bachelor's degree 6 = Postgraduate /Doctorate
Marital Status	1 = Single 2 = Married 3 = Divorced 4 = Spouse died
Chronic Diseases (NCDs)	
Asthma	1 = Yes 2 = No
COPD	

Variable Name	Coding
Myocardial infarction	
Coronary heart disease	
Stroke	
Low back disorder	
Neck disorder	
Diabetes	
Kidney problems	
Depression	
Multimorbidity	
Risk Factors	
Tobacco use	1 = Yes 2 = No
Alcohol consumption	1 = Yes 2 = No
Physical activity level	1 = Sufficient 2 = Insufficient
BMI	1 = Normal/Underweight 2 = Overweight/Obese
Hypertension	1 = Yes 2 = No
Health Status Variables	
Self-perceived health status	1 = Very good/Good 2 = Fair 3 = Poor/Very poor
ADL	1 = Limited 2 = Not limited
IADL	1 = Limited 2 = Not limited

Statistical Analyses

Both independent variables and dependent variables are categorical. It is reported that the most appropriate regression method to use in cases where the independent variables are continuous or categorical and the dependent variable has two or more categories is the logistic regression analysis method (Karagöz, 2019). Additionally, the logistic regression analysis method to be used varies depending on the number of categories in the dependent variable. If the dependent variable has two categories, binary logistic regression is used; if it has at least three categories, the multinomial logistic regression analysis method is used (Karagöz, 2019). Accordingly, in this study, the binary logistic regression analysis method was used since the independent variables were categorical and the dependent variables of ADLs and IADLs under the health status dimension were binomial. Since the perceived health status variable has three categories, the effect of independent variables on these dependent variables was analysed by multinominal logistic regression analysis. The fit of the binary logistic regression models to the data was analysed by the Hosmer and Lemeshow test, and the Likelihood Ratio test analysed the fit of the multinominal logistic regression models. Chi-square values are obtained using the Hosmer and Lemeshow test and the Likelihood Ratio test. The Hosmer and Lemeshow value should be

statistically insignificant ($p > 0.05$), while the Likelihood Ratio test value should be statistically significant ($p < 0.05$) for the model to be considered compatible. If the assumptions are met, it can be said that there is an association between independent variables and dependent variables. Nagelkerke's pseudo R^2 was used to evaluate the explanatory power of the independent variables within the logistic regression model (Karagöz, 2019; Rençber, 2018). To assess multicollinearity among categorical variables, we manually dummy-coded the variables and performed a linear regression analysis. All VIF values ranged between 1 and 2, indicating no significant multicollinearity.

All models were adjusted for the previously listed covariates. All analyses were performed with SPSS version 23.0. Statistical significance was defined as a p-value of ≤ 0.05.

Results

Among the participants, 54.9% were female, 68.9% were between the ages of 45-64, 56.3% did not finish a school/primary school and 79.4% were married. Almost 20% of the participants had very poor/poor self-perceived health, 4.0% had limited ADLs, and 25.8% had limited IADLs (Table 2).

Table 2
Individual Characteristics of Participants

Individual Characteristics	n (%)
Gender	
Female	4329 (54.9)
Male	3560 (45.1)
Age	
45-54	2918 (37.0)
55-64	2513 (31.9)
65-74	1589 (20.1)
75+	869 (11.0)
Educational Status	
Illiterate	1163 (14.7)
Didn't finish a school/Primary school	4445 (56.3)
Secondary school	626 (7.9)
High school	880 (11.2)
Associate degree/Bachelor's degree	687 (8.7)
Postgraduate /Doctorate	88 (1.1)
Marital Status	
Single	168 (2.1)
Married	6260 (79.4)
Divorced	325 (4.1)
Spouse died	1136 (14.4)
Health Status Variables	
Self-Perceived Health	
Very poor/poor	1573 (19.9)
Fair	3310 (42.0)
Good/Very good	3006 (38.1)
ADLs	
Limited	316 (4.0)
Not limited	7573 (96.0)
IADLs	
Limited	2039 (25.8)
Not limited	5850 (74.2)
TOTAL	7889 (100)

Figure 1 illustrates the prevalence of NCDs and the risk factors among the participants. According to these results, it was determined that the NCDs with the highest prevalence were low back disorder (43.5%), neck disorder (31.7%), and diabetes (21.6%). The prevalence of individuals with at least two of the mentioned NCDs was found to be 46%. When the prevalence of risk factors was analysed, it was found that the risk factors with the highest prevalence were overweight/obese (72.7%), insufficient physical activity (68.1%), tobacco use (48.9%) and hypertension (35.9%), respectively.

Figure 1
Prevalence of NCDs and Risk Factors in Participants

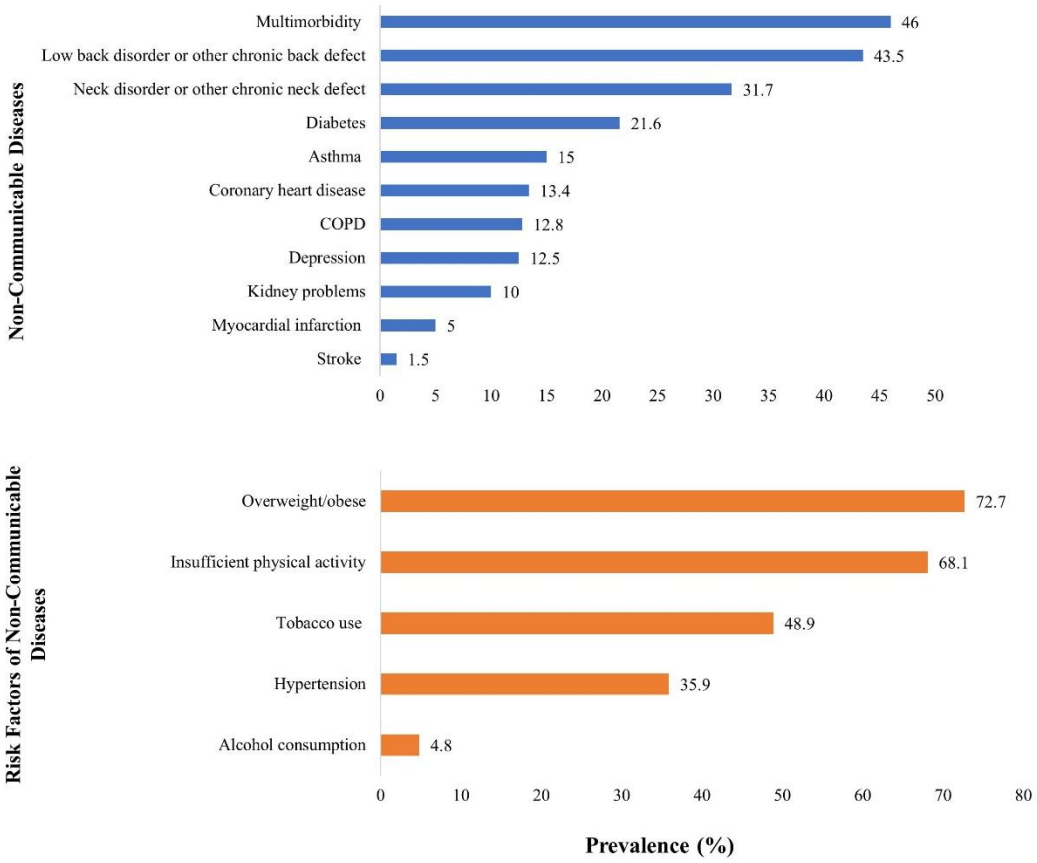

Table 3 presents the results of the analysis examining the impact of NCDs on self-perceived health. The results of the analysis are presented in three stages (Model 1, unadjusted; Model 2, adjusted for gender, age, educational status, and marital status; Model 3, adjusted for gender, age, educational status, marital status, hypertension, overweight/obese, insufficient physical activity, tobacco use, and alcohol consumption). In the unadjusted model 1, all NCDs were statistically associated with very poor/poor self-perceived health. The NCDs with the highest effect were stroke (OR=8.25), myocardial infarction (OR=3.85), coronary heart disease (OR=3.53), multimorbidity (OR=3.28), and diabetes (OR=3.11). The NCDs with the least effect according to the OR value were low back disorder and neck disorder. Similar results were found in Models 2 and 3, where adjustments were made according to individual characteristics and risk factors. In Models 2 and 3, it was observed that OR values decreased in almost all NCDs compared to Model 1. Although the OR values decreased, all NCDs remained significantly associated with reporting very poor/poor or fair self-perceived health across all models.

Table 3

Multinominal Logistic Regression Analysis Results of the Effect of NCDs on Self-Perceived Health

NCDs	Self-perceived health status	Model 1[a] OR (95% CI)	Model 2[b] OR (95% CI)	Model 3[c] OR (95% CI)
Stroke	Very poor/poor	8.25 (3.85-17.64)*	5.66 (2.57-12.46)*	4.66 (2.11-10.29)*
	Fair	3.10 (1.46-6.54)*	2.55 (1.19-5.47)*	2.22 (1.03-4.77)*
Myocardial infarction	Very poor/poor	3.85 (2.46-6.01)*	3.67 (2.31-5.84)*	3.22 (2.02-5.13)*
	Fair	2.01 (1.30-3.10)*	1.90 (1.22-2.95)*	1.78 (1.14-2.78)*
Kidney problems	Very poor/poor	2.86 (2.17-3.78)*	2.53 (1.89-3.39)*	2.35 (1.76-3.15)*
	Fair	1.92 (1.49-2.49)*	1.80 (1.38-2.35)*	1.74 (1.33-2.26)*
Depression	Very poor/poor	2.11 (1.66-2.68)*	2.64 (2.05-3.40)*	2.70 (2.09-3.48)*
	Fair	1.58 (1.27-1.97)*	1.65 (1.32-2.07)*	1.65 (1.32-2.06)*
COPD	Very poor/poor	2.56 (1.96-3.33)*	2.00 (1.51-2.64)*	1.98 (1.49-2.62)*
	Fair	1.64 (1.28-2.10)*	1.46 (1.13-1.88)*	1.43 (1.11-1.84)*
Coronary heart disease	Very poor/poor	3.53 (2.71-4.60)*	3.09 (2.34-4.07)*	2.78 (2.11-3.68)*
	Fair	2.18 (1.70-2.79)*	2.02 (1.56-2.60)*	1.85 (1.43-2.39)*
Asthma	Very poor/poor	2.47 (1.92-3.17)*	2.32 (1.79-3.02)*	2.25 (1.73-2.92)*
	Fair	1.68 (1.33-2.11)*	1.55 (1.23-1.96)*	1.54 (1.21-1.94)*
Diabetes	Very poor/poor	3.11 (2.52-3.85)*	2.79 (2.23-3.49)*	2.32 (1.85-2.91)*
	Fair	2.33 (1.92-2.82)*	2.09 (1.72-2.55)*	1.85 (1.52-2.26)*
Neck disorder or other chronic neck defect	Very poor/poor	1.61 (1.30-2.00)*	1.70 (1.36-2.14)*	1.64 (1.31-2.06)*
	Fair	1.49 (1.23-1.80)*	1.52 (1.25-1.85)*	1.48 (1.22-1.81)*
Low back disorder or other chronic back defect	Very poor/poor	1.87 (1.52-2.31)*	1.70 (1.37-2.12)*	1.68 (1.35-2.10)*
	Fair	1.50 (1.25-1.80)*	1.41 (1.17-1.70)*	1.40 (1.16-1.69)*

NCDs	Self-perceived health status	Model 1[a] OR (95% CI)	Model 2[b] OR (95% CI)	Model 3[c] OR (95% CI)
Multimorbidity	Very poor/poor	3.28 (2.19-4.95)*	3.35 (2.19-5.12)*	3.18 (2.07-4.85)*
	Fair	2.28 (1.62-3.22)*	2.30 (1.62-3.27)*	2.26 (1.59-3.21)*
		χ^2=2588.095 p=0.001; Nagelkerke R^2: 0.318	χ^2=3344.457 p=0.001; Nagelkerke R^2: 0.393	χ^2=3562.619 p=0.001; Nagelkerke R^2: 0.414

Note. Reference category for Self-Perceived Health Status = very good/good. Reference category for NCDs = no. Reference category for Multimorbidity = 0. Abbreviations: CI = confidence interval; OR = odds ratio; COPD = chronic obstructive pulmonary disease. *P-value <0.05 aModel 1 was unadjusted. bModel 2 was adjusted for gender, age, educational status, and marital status. cModel 3 was adjusted for gender, age, educational status, marital status, hypertension, overweight/obese, insufficient physical activity, tobacco use and alcohol consumptio

Table 4 presents the results of the analysis examining the impact of NCDs on ADLs. The results of the analysis are presented in three stages. In all models, stroke, kidney problems, depression, coronary heart disease, low back disorder, and multimorbidity (except Model 3) were associated with limited ADLs, and the results were statistically significant. In all models, stroke was found to have the most significant impact on the limitation of ADLs. According to OR values, other NCDs limiting ADLs are multimorbidity, kidney problems, depression, coronary heart disease, and low back disorder, respectively. In Models 2 and 3, it was observed that OR values decreased in all NCDs except depression, compared to Model 1.

Table 4

Binary Logistic Regression Analysis Results of the Effect of NCDs on ADLs

NCDs	Model 1[a] OR (95% CI)	Model 2[b] OR (95% CI)	Model 3[c] OR (95% CI)
Stroke	5.97 (3.76-9.50)*	5.22 (3.16-8.61)*	5.14 (3.11-8.51)*
Myocardial infarction	1.42 (0.97-2.07)	1.22 (0.81-1.84)	1.19 (0.79-1.80)
Kidney problems	2.14 (1.62-2.82)*	1.80 (1.34-2.42)*	1.77 (1.32-2.39)*
Depression	1.33 (1.00-1.76)*	2.06 (1.51-2.80)*	2.10 (1.54-2.87)*
COPD	1.26 (0.92-1.73)	0.84 (0.59-1.19)	0.85 (0.60-1.21)
Coronary heart disease	1.62 (1.21-2.16)*	1.49 (1.10-2.02)*	1.47 (1.08-2.00)*
Asthma	1.25 (0.92-1.70)	1.30 (0.93-1.81)	1.29 (0.92-1.81)
Diabetes	1.18 (0.91-1.53)	1.16 (0.88-1.52)	1.14 (0.86-1.51)
Neck disorder or other chronic neck defect	1.04 (0.79-1.36)	1.05 (0.78-1.42)	1.04 (0.77-1.41)
Low back disorder or other chronic back defect	1.63 (1.20-2.20)*	1.50 (1.08-2.08)*	1.50 (1.08-2.09)*

NCDs	Model 1[a] OR (95% CI)	Model 2[b] OR (95% CI)	Model 3[c] OR (95% CI)
Multimorbidity	2.89 (1.61-5.19)*	1.88 (1.02-3.47)*	1.82 (0.98-3.35)
	χ^2=11.424 p=0.076; Nagelkerke R^2: 0.144	χ^2=7.943 p=0.439; Nagelkerke R^2: 0.285	χ^2=3.865 p=0.869; Nagelkerke R^2: 0.300

Note. Reference category for ADL = not limited. Reference category for NCDs = no. Reference category for Multimorbidity = 0. Abbreviations: CI = confidence interval; OR = odds ratio; COPD = chronic obstructive pulmonary disease. *P-value <0.05 aModel 1 was unadjusted. bModel 2 was adjusted for gender, age, educational status, and marital status. cModel 3 was adjusted for gender, age, educational status, marital status, hypertension, overweight/obese, insufficient physical activity, tobacco use and alcohol consumption

Table 5 presents the results of the binary logistic regression analysis of the effect of NCDs on IADLs. The results of the analysis are presented in three stages. All NCDs in Model 1, NCDs except kidney problems and asthma in Model 2 and NCDs except myocardial infarction, kidney problems, asthma and diabetes in Model 3 were associated with limited IADLs, and the results were statistically significant. Stroke was most strongly associated with limitations in IADLs. Other NCDs that showed significant associations with IADL limitations included multimorbidity, COPD, coronary heart disease, low back disorder, and depression.

Table 5

Binary Logistic Regression Analysis Results of the Effect of NCDs on IADLs

NCDs	Model 1[a] OR (95% CI)	Model 2[b] OR (95% CI)	Model 3[c] OR (95% CI)
Stroke	3.90 (2.57-5.91)*	3.29 (2.11-5.12)*	3.02 (1.94-4.71)*
Myocardial infarction	1.28 (1.01-1.63)*	1.35 (1.04-1.74)*	1.27 (0.98-1.65)
Kidney problems	1.22 (1.03-1.44)*	1.04 (0.86-1.25)	1.01 (0.84-1.21)
Depression	1.59 (1.36-1.85)*	1.92 (1.63-2.27)*	1.95 (1.65-2.31)*
COPD	1.83 (1.55-2.16)*	1.51 (1.26-1.81)*	1.51 (1.26-1.81)*
Coronary heart disease	1.70 (1.45-1.99)*	1.60 (1.35-1.90)*	1.55 (1.30-1.85)*
Asthma	1.18 (1.00-1.38)*	1.06 (0.89-1.26)	1.04 (0.87-1.24)
Diabetes	1.39 (1.21-1.59)*	1.19 (1.03-1.38)*	1.13 (0.98-1.31)
Neck disorder or other chronic neck defect	1.35 (1.17-1.55)*	1.32 (1.14-1.54)*	1.32 (1.13-1.54)*
Low back disorder or other chronic back defect	1.66 (1.44-1.91)*	1.49 (1.28-1.74)*	1.49 (1.28-1.74)*

NCDs	Model 1[a] OR (95% CI)	Model 2[b] OR (95% CI)	Model 3[c] OR (95% CI)
Multimorbidity	2.07 (1.61-2.65)* χ^2=13.058 p=0.050; Nagelkerke R^2: 0.200	1.77 (1.35-2.30)* χ^2=14.251 p=0.075; Nagelkerke R^2: 0.334	1.71 (1.31-2.23)* χ^2=14.342 p=0.073; Nagelkerke R^2: 0.350

Note. Reference category for IADL = not limited. Reference category for NCDs = no. Reference category for Multimorbidity = 0. Abbreviations: CI = confidence interval; OR = odds ratio; COPD = chronic obstructive pulmonary disease. *P-value <0.05 aModel 1 was unadjusted. bModel 2 was adjusted for gender, age, educational status, and marital status. cModel 3 was adjusted for gender, age, educational status, marital status, hypertension, overweight/obese, insufficient physical activity, tobacco use and alcohol consumption

Discussion

Healthcare, a fundamental human right protected by laws and policies, is shaped by various factors—most notably NCDs. NCDs cause disability, premature death, and deterioration in physical and mental health worldwide, with underdeveloped and developing countries like Türkiye being disproportionately affected. In these countries, NCDs are reported to primarily affect adults and the elderly (US Department of Health and Human Services, 2011). This study assessed the impact of selected NCDs (stroke, myocardial infarction, kidney problems, depression, COPD, coronary heart disease, asthma, diabetes, neck and low back disorders) on self-perceived health, ADLs, and IADLs in adults aged 45 and over in Türkiye.

The prevalence rates identified in this study—19.9% for very poor/poor self-perceived health, 4.0% for ADL limitations, and 25.8% for IADL limitations—are consistent with findings reported in national and international literature (Republic of Türkiye Ministry of Health, 2013; World Health Organization, 2018; Ho et al., 2022). In European countries, the prevalence of very poor/poor self-perceived health has been reported as approximately 10% among individuals aged 45–64 years and around 20% among those aged 65 and older (Eurostat, 2023). Similarly, OECD data highlight a marked decline in self-perceived health status after the age of 45 (OECD, 2023). In Southeast Asian countries, ADL and IADL limitations were reported at 21.5% and 46.8%, respectively, among older adults (Yau, Foo, Cheah, Tang, & Lee, 2022), while in 17 European countries, these rates were 11.7% for ADLs and 17.6% for IADLs (Scheel-Hincke et al., 2019). Although variations may arise due to methodological and demographic differences, the comparability of these findings supports the credibility and generalizability of the present study's results.

Three different models were constructed with and without adjustment for individual characteristics and risk factors covariates while evaluating the effect of NCDs on self-perceived health, ADLs and IADLs health status variables. Compared to Model 1, which was not adjusted for individual characteristics and risk factors, the OR values of Model 2 (adjusted for individual characteristics) and Model 3 (adjusted for individual characteristics and risk factors together) decreased. Despite the decrease in OR values, even after controlling for covariates, those with NCDs were more likely to experience very poor/poor perceived health status, ADLs and IADLs limitation compared to those without NCDs.

In the unadjusted model 1, adjusted model 2, and adjusted model 3, which were established to evaluate the association between NCDs and self-perceived health, it was found that all NCDs were associated with very poor/poor and fair self-perceived health. The NCDs with the highest effect were cardiometabolic diseases and multimorbidity. A study conducted by Tema Filha et al. (2015) found that people who had asthma, coronary heart disease, diabetes, depression and stroke were more likely to have poor self-perceived health compared to others. Among the aforementioned diseases, cardiometabolic diseases were found to have the highest effect on having poor self-perceived health. A study conducted in China found that asthma, COPD, coronary heart disease, stroke, diabetes, kidney problems and depression were found to be effective on having very poor/poor self-perceived health. Among these diseases, cardiometabolic diseases were found to have the highest impact on self-perceived health (Wu et al., 2013). In another study conducted with more than five hundred thousand people in China, asthma, coronary heart disease, stroke, diabetes, kidney problems and depression were found to be determinants of poor health status. Cardiometabolic diseases were determined as the diseases with the highest OR coefficient (Song et al., 2018). In another study conducted in Brazil, an association was found between NCDs and poor/very poor self-perceived health (Barros, Zanchetta, Moura, & Malta, 2009). In a study conducted in Spain examining the association between low back and neck problems and self-perceived health, it was determined that individuals with low back and neck problems had more very poor/poor health status compared to others (Fernández-de-Las-Peñas et al., 2013). Kim, Keshavjee, and Atun (2020) examined the effect of multimorbidity on self-perceived health in approximately 69,000 individuals in South Korea and found that multimorbidity was associated with a deterioration in self-perceived health. It is seen that the results of the aforementioned studies and the results of this study are similar. The reasons such as the long-term course of NCDs, causing disability and decreasing the quality of life may be effective in the fact that individuals exposed to NCDs have a very poor/poor health status more than those who are not exposed to NCDs.

In this study, the association between NCDs and ADLs and IADLs was evaluated in three models: unadjusted model 1, adjusted model 2 adjusted for individual characteristics, and adjusted model 3 adjusted for both individual characteristics and risk factors. In all models, stroke, kidney problems, depression, coronary heart disease, low back disorder, and multimorbidity (except Model 3) were found to limit ADLs. When IADL results were analysed, it was determined that all NCDs in Model 1, NCDs except kidney problems and asthma in Model 2, and NCDs except myocardial infarction, kidney problems, asthma, and diabetes in Model 3 limited IADLs. According to OR coefficients, in all models, stroke and multimorbidity were found to have the highest effect on ADLs and IADLs. It is seen that the NCDs that have a limiting effect on ADLs are fewer in number than the NCDs that have a limiting effect on IADLs. Since ADLs are the skills required to manage/realise basic physical needs, while IADLs are more complex and provide the ability to live independently in society, it can be said that NCDs limited IADLs at the beginning and have an effect on ADLs with increasing severity of the diseases (Edemekong, Bomgaars, Sukumaran, & Levy, 2021). It was observed that the results of the studies in the literature and the results of this study were largely similar. In the study examining the association between NCDs and ADLs and IADLs in the USA, it was determined that asthma, COPD, coronary heart disease, stroke, diabetes, kidney problems, depression and multimorbidity were effective in limiting ADLs and IADLs skills. Among these

diseases, stroke was found to be the NCD with the highest impact on ADLs and IADLs (Bowling et al., 2019). In a study conducted in Brazil, it was determined that those with asthma, COPD, coronary heart disease, stroke, low back problems, diabetes, kidney problems, depression and multimorbidity were more limited in performing ADLs and IADLs compared to others (Reis et al., 2023). Similar results were found in a study conducted by Whitson et al. (2010), which revealed that cardiometabolic diseases have a restrictive effect on ADLs. In a study in the UK, cardiometabolic diseases and depression were found to have a limiting effect on IADLs (d'Orsi et al., 2014). NCDs are seen to have the potential to directly or indirectly limit ADL and IADL activities. For example, COPD negatively affects the ability to perform complex daily tasks by reducing exercise capacity. Diabetes can cause functional impairments through complications such as neuropathy and vision loss. Depression is indirectly related to the restriction of daily activities. Additionally, it can reduce coping ability and adherence to treatment, thereby increasing the burden of other diseases. In addition, when diseases are combined with increasing age, they can cause further deterioration in ADL and IADL.

Limitations

A formal conceptual framework was not applied, which may limit the theoretical coherence of variable selection and interpretation. The data in this study are cross-sectional, and changes in NCDs and health status variables over time are not considered. Since the data are cross-sectional, causal explanations cannot be made about the association between NCDs and health status variables. Longitudinal data are needed to understand better the causality among these variables. In addition, health status variables may have been affected by NCDs or other health problems not included in this study.

The presence of risk factors and NCDs is determined based on participants self-reports and classified accordingly. Similarly, data on health status variables are based on self-reported information from participants.

Although multiple predictors were tested across three logistic regression models, no formal correction for multiple comparisons was applied. As a result, the possibility of inflated Type I error cannot be ruled out. However, the analyses were exploratory in nature, aiming to identify potential associations rather than confirm definitive causal relationships.

Conclusion

The Lancet Commission on Global Health predicts that new epidemics, antimicrobial resistance, global warming and NCDs will pose the greatest threats to global public health in the future. The Commission reports that devastating health and financial consequences may occur, especially in underdeveloped and developing countries, due to NCDs (Jamison et al., 2013). In this study, the impact of NCDs on health status variables (self-perceived health status, ADL and IADL) was evaluated at the national level in Türkiye, one of the developing countries. The findings of this study may be considered valuable, given the limited number of studies

evaluating the impact of NCDs on functional health at the national level in Türkiye, most of which have focused on a narrow range of diseases.

Before assessing the association between NCDs and health status variables, regression models were adjusted for individual characteristics and risk factors that may affect NCDs. Compared to the unadjusted model (Model 1), the OR values of Model 2 (adjusted for individual characteristics) and Model 3 (adjusted for individual characteristics and risk factors together) were lower. However, it was determined that those with NCDs were more likely to experience very poor/poor self-perceived health, ADLs and IADLs limitation compared to those without NCDs.

According to the results of this study, all NCDs were significantly associated with an increased likelihood of reporting very poor/poor self-perceived health across all models. In contrast, a smaller number of NCDs were significantly associated with limitations in ADLs, specifically stroke, kidney problems, depression, coronary heart disease, low back disorder, and multimorbidity (except in model 3). The NCDs more strongly associated with IADL limitations than with ADL limitations included stroke, COPD, depression, coronary heart disease, neck disorder, low back disorder, and multimorbidity. When all health outcomes were considered together, stroke, cardiovascular diseases, and multimorbidity showed the strongest overall associations with adverse health status.

According to the aforementioned results, since NCDs develop due to risk factors, it is recommended to develop plans and implement policies to mitigate existing risk factors. In the treatment of diseases, support from the social environment is as important as individual responsibility. Individuals around the patients can help them carry out their vital activities and provide support for the development of their mental health. The quantity and quality of home treatment and care services provided by local governments and health institutions to individuals with limitations in managing vital activities should be improved. In future research, individuals' disease or risk factor status could be assessed through biochemical measurements and physician diagnosis, allowing for a thorough evaluation of the impact of NCDs on health status. Furthermore, the causality relationship between NCDs and health status variables could be explored through cohort studies or longitudinal data analysis.

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