Evaluating the Impact of Demographic Covariates on Healthcare Access and NCD Risk: Evidence from a Cross-Sectional Survey in Five Arab Countries

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Abstract: This study evaluated how demographic factors and socio-economic factor influence on the healthcare access and non-communicable disease (NCD) risk in the five different Arab countries. It has also investigating how Gender moderates this relationship. It has used quantitative cross-sectional design where data was collected from 400 respondents in Egypt, Saudi Arabia, Jordan, Morocco and the United Arab Emirates. The data was analysed using binary logistic regression and chi-square tests. The results indicated considerable variation across countries in terms of access to health care and NCD risk. In the access to health care services category, the highest frequency was observed in the UAE and Morocco, whereas the lowest frequency was recorded in Egypt and Saudi Arabia. With regard to NCD risk, the highest and lowest frequencies were observed in Egypt and Saudi Arabia and the UAE and Morocco, respectively. The logistic regression indicated that factors such as age, residence, education, employment status, income level, housing arrangements, and assets ownership had significant impacts on access to healthcare services and NCD risk. Factors like age positively influenced access to health services and NCD risk while education, high-income levels, and assets ownership negatively impacted NCD risk. Even though the effect of gender was directly influenced by the two health variables, moderation analysis revealed that gender did not influence the relationship between them. The study has highlighted importance of socioeconomic determinants in shaping health outcomes across Arab countries and suggests that policies aimed to improve education, economic conditions and healthcare accessibility are effective in reducing NCD risk and promoting equal healthcare access than gender specific intervention alone. Hence, this study neglects the theoretical norm of gender differences and rather indicates that other SES factors can be evaluated for having a moderating role in this regards.

Keywords: Demographic Covariates, Healthcare Access, Non-communicable Diseases (NCDs), Urban vs. Rural Residence, Socioeconomic Status (SES), Public Health Outcomes.

1. INTRODUCTION

An understanding of the manner in which demographic covariates impact public health is essential for creating health policies that will contribute to health improvements in an equitable manner [1]. Age, sex, educational attainment, socioeconomic status, urban versus rural residence, and reproductive behavior have long been recognized as significant predictors of health outcomes that vary across societies, affecting disease incidence rates, availability of care services, and health behaviors [2,3]. These variables serve as the basis for analysis on the levels of non-communicable diseases and maternal/child health outcomes around the world.

The Arab Region, which comprises 22 countries spanning Western Asia and Northern Africa, has demographic trends and experiences of socio-economic development that are quite distinct [4] The demographic structure of the Arab region has traditionally seen relatively high fertility rates alongside low mortality trends [5]. However, the region's ongoing process of urbanization and the increasing phenomenon of migration has created new demographic conditions that hold important consequences for health systems in the region. The important point to note is that there is no empirical evidence of any sort that relates to the relationship between demographic characteristics and health outcomes.

Past studies conducted in the region had pointed to socio-demographic and demographic factors affecting particular health issues. In the same way, studies on hypertension and prevalence rates have shown wide disparities among various Arab communities, indicating that demographic variables affect chronic diseases. The association between fertility rates, maternal attributes, socio-economic indicators, and infant mortality rates in GCC countries illustrates the multi-faceted impact of socio-demographic variables on health conditions [6-9]. Besides, a study in Kuwait using data from a nationwide survey indicated that multimorbidity in adult population was highly connected to socio-demographic and lifestyle variables [10].

Nevertheless, there is a paucity of studies that attempt to provide a synthesis of such individual country-specific information within the context of a broader regional framework based on sound statistical modeling and reliable population-based surveys. Such a situation is even more apparent when efforts are made to comprehensively measure the impact of various demographic covariates on different health

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outcomes in various Arab settings. To address such a deficiency, there must be an analytic method whereby the theoretical knowledge gained about demographic variables is analyzed statistically using appropriate data from large-scale surveys [11-13]. The purpose of this research, thus, is to determine the effects of selected demographic covariates on different health outcomes in Arab states based on rigorous statistical analysis of cross-sectional studies.

This changing environment highlights the significance of studying demographic covariates but as structuring forces that increases exposure, vulnerability, and service access among populations. In the meantime, urbanisation has been frequently linked to the enhanced healthcare infrastructure, increased service density, and enhanced preventive coverage. [14], the proliferation of primary healthcare networks instilled into community and school contexts has proven to generate quantifiable changes in behavioural awareness, physical activity and biometric indicators in urban populations. These interventions are examples of how the closeness to organised health systems may support screening, counselling and continuity of care.

Nevertheless, urban living also results in a documented risk transition. However, the urban environments that provide greater access are also linked to sedentary behaviour, consumption of processed food and psychological stress linked with the development of chronic diseases. Regional demographic reviews observe that the rapid urban development has exerted strain on the community resources and altered behavioural risk spaces, resulting in new health burdens, as well as an increase in the availability of services. This two-sidedness, where access is better but metabolic and cardiovascular risk is higher, is the empirical foundation of hypothesis one, which posits that urban residence is a structurally ambivalent determinant of health. Instead of bringing equal benefit, urbanicity presents a multifaceted interaction between healthcare access and disease exposure through lifestyle.

The heterogeneity of Arab countries in terms of demographic age structure is striking. However, on the one hand, some Gulf countries have an expatriate majority in terms of their demographics, while on the other hand, some of them are at the stage of demographic maturation because of their higher life expectancy rates and increased cases of chronic diseases [15]. This diversity has far-reaching effects on the national health profiles, spending patterns, and prevention priorities showed that regional NCD programmes evidence that quantifiable changes in blood pressure, glucose regulation, and behavioural risk factors need long-term, system-wide involvement, a task which becomes increasingly urgent as populations age and the management of chronic diseases takes over from acute care as the main role of the health system. On the macro level, demographic forecasts of urban growth that connect population growth in the long-term to urban growth demonstrate that the age structure and spatial redistribution are both related to the restructuring of demand for healthcare services and prevention structures. These changes support the claim that the cross-country differences in the Arab world cannot be explained by the health issues without considering the demographic makeup.

The current research is a valuable theoretical, empirical, and practical contribution to the existing literature on public health and health disparities in the Arab region. On a theoretical level, the study contributes to the existing Social Determinants of Health model since it demonstrates that socioeconomic resources, education, income, employment, and assets play an essential role in healthcare access and non-communicable diseases' prevalence. Furthermore, it is necessary to note that the current research questions the assumption about the impact of gender on health outcomes since it indicates that gender does not moderate the effect of social determinants on healthcare access or non-communicable disease risk among individuals in the examined regions.

On an empirical level, the study provides data concerning healthcare access and non-communicable diseases' prevalence in five Arab nations, namely Egypt, Saudi Arabia, Jordan, Morocco, and UAE, where research on the discussed issue was scarce before. It provides robust evidence about demographic and socioeconomic predictors of health outcomes and indicates considerable cross-national differences in healthcare access and prevalence of non-communicable diseases among nations.

From a practical perspective, there are various implications of the study to policy makers and public health practitioners. It is evident from the findings that any intervention needs to focus on social and economic inequality, education levels, and healthcare access, instead of gender-oriented interventions only. Any program to improve education, economic empowerment, and access to healthcare services can be helpful in mitigating risks of NCDs among various population groups in the Arab world.

2. METHODOLOGY

2.1. Study Design

The current study used a cross-sectional analytical design to examine the role of the chosen demographic covariates and socioeconomic factors on healthcare

access and NCD risk among adults in Arab countries. The cross-sectional design enabled evaluating relationship between demographic characteristics and public health outcomes at single point of time while facilitating comparisons across various national contexts. The study also investigates the moderating role of gender on the relationship between socio-economic factors and healthcare access and NCD risk. The methodology was also adopted by [16,17] when evaluating the public health outcomes.

2.2. Data Collection and Sample

The research included 400 adult respondents aged above 18 years from five Arab countries such as Egypt, Saudi Arabia, Jordan, Morocco and the United Arab Emirates. The participants were selected to ensure equal representation, and 80 respondents were recruited from each nation. The inclusion criteria for respondents included participants to be adult aged 18 years or older and are capable of providing information regarding demographic characteristics, healthcare access and NCD status. The survey was distributed online through portals such as LinkedIn, Facebook and other social media platforms and where possible researcher has gotten the form filled face to face as well. The survey was designed in English and also translated it into Arabic so that it is understandable for wider population.

2.4. Variables

2.4.1. Dependent Variables (Public Health Outcomes)

Two public health outcomes were evaluated such as healthcare access and NCD risk. Healthcare access is a binary variable indicating whether respondents had access to healthcare services Two questions were used to evaluate healthcare access: 1) attendance at a routine health check-up and 2) participation in preventive health screening. Respondents answered “Yes” to at least one of the questions were coded as having healthcare access (1), while those who answered “No” to both questions were coded as not having healthcare access (0).

NCD risk was assessed using four behavioural risk factors: smoking, insufficient physical activity, inadequate fruit and vegetable consumption, and frequent intake of sugary or processed foods. One point was assigned for each risk factor present. Respondents with two or more risk factors were classified as having elevated NCD risk (1), otherwise low risk (0).

2.4.2. Independent Variables

The independent variable in the study were demographic covariates and socioeconomic status. The demographic covariates included Urban/Rural residence, Gender, and Age. These variables were chosen as they are identified to be the most significant part that impact on the public health outcomes. Gender and Residence are binary variables. Gender included Male and Female. Residence included Urban and Rural residence. Age of the participants were set as nominal variable where age ranges were set as 18-24, 25-34, 35-44, 44-55 and 55+. Socio-economic status (SES) included variables such as income level, type of housing and asset count. The income level was in ordinal form in the sequence of low income, lower-middle income, middle income, upper-middle income and high income. The type of housing includes categories such as owned house/apartment, rented house/apartment, shared accommodation and other. Furthermore, asset count provided different options to the respondent to select and the number of items selected were then counted and included as continuous variables. These factors were indicated to be important in the research by [18-20]. The survey questionnaire that include these questions is provided in Appendix A below.

2.4.3. Control Variables

The study also included certain control variables as well which included education level, employment status and marital status. Control variables were included so that these factors can be held constant to ensure that only independent variables are affecting the dependent variable. They separate the exact relationship being tested, hence restricting other factors from distorting or skewing the final results. It has been considered to remove any confounding bias in the study and ensure that the results obtained are statistically robust.

2.4.3. Moderating Variable

Gender was included as a moderating variable to determine whether it altered the relationship between selected socioeconomic factors and the two public health outcomes. Interaction terms were created between gender and age group, income level, housing type, assets count, and residence.

The hypotheses are developed as below

H1: Demographic characteristics such as age and gender has significant impact on healthcare access and NCD risk

H2: Socio-economic status has significant impact on healthcare access and NCD risk

H3: Gender significantly moderates the relationship of demographic variables and socio-economic status on healthcare access and NCD risk.

2.5. Data Analysis

The data was mainly analysed using binary logistic regression. Binary logistic regression is applied in researches where dependent variable is binary (1/0). It helps to evaluate the probability of the occurrence of an event from either 1 or 0 and provide odds ratios to indicate likelihood of occurrence based on a variable. The analysis was further supported by different other tests. The descriptive analysis was conducted to indicate the participants profile. Furthermore, cross country comparison was conducted using Chi-Square test which evaluate the differences between two different categorical variables. Furthermore, Model accuracy was tested through different parameters such as Omnibus Tests of Model Coefficients, Hosmer-Lemeshow Goodness of Fit tests, Cox and Snell R^2, NagelKerke R^2, and classification accuracy statistics. Furthermore, Receiver Operating Characteristic (ROC) curve analysis and Area Under the Curve (AUC) values were used further to evaluate predictive performance and discriminative capability of the models. It has been conducted to ensure robustness of the statistical findings obtained and ensure that the analysis is accurate and true representation.

2.6. Bias Control and Data Quality Assurance

A few actions have been taken to address possible biases during this study. Firstly, in order to prevent any form of selection bias, respondents were recruited from several Arab nations and distributed using both virtual and face-to-face means through a number of platforms. The questionnaire was offered in two languages, English and Arabic, in order to accommodate people with varying educational backgrounds.

Information and measurement biases were prevented by adopting standard survey questions which have already been used in earlier studies on public health. Additionally, the survey questions were piloted before being sent out for data collection.

In order to reduce the effects of social desirability bias, the anonymity of participants was ensured and they were advised at the outset that there would be no need for providing any personal data that might identify an individual respondent. This helped participants to report on their actual experiences without fear of any embarrassment or repercussions.

Finally, in order to prevent the effects of confounding, the statistical test of logistic regression included important control variables like education, employment, and marital status. Multicollinearity diagnostics were also undertaken with all values of Variance Inflation Factor (VIF) remaining well below recommended thresholds.

2.6. Ethical Considerations

The study complied with established ethical principles for social and public health research. Participants were ensured voluntary participation and that they can withdraw from the survey anytime they want. All responses were anonymised to ensure confidentiality. No such information was collected or reported that is confidential or can be a personal identification. Data were analysed solely for the academic purposes and findings were presented in aggregate form for protecting respondent's privacy.

3. RESULTS

Table **1** shows the demographic analysis of the sample. The sample comprised of 400 respondents who were equally divided among five countries, which included Egypt, Saudi Arabia, Jordan, Morocco, and United Arab Emirates, where each country constituted 20%. There was also an even balance between the age of respondents where the maximum percentage belonged to the age group of 45-54 years (22.0%) whereas the minimum percentage was of 35-44 years old (17.0%). The highest percentage of females among the total respondents was 52.3%, while the males accounted for 47.8%. Around 53.3% of the respondents belonged to the rural setting, whereas 35.8% of the respondents had divorced/widow marital status. Secondary education was considered as the highest educational category (21.5%). In terms of work, 24.5% were working respondents. Middle class individuals made the highest income category (27.3%). Rentals comprised the largest housing arrangement category (26.5%). The percentages of healthcare access and prevalence of NCD risk were equal with 48.3% for both categories.

Based on the chi-square results, there was a significant relationship between the country of residence and healthcare access, χ^2 (4, N = 400) = 21.49, $p < .001$. There was great variation in access to healthcare among the five nations studied. The two countries which had the largest percentages of respondents who accessed healthcare were the United Arab Emirates (63.8%) and Morocco (58.8%), and the two with the smallest percentages were Saudi Arabia (35.0%) and Egypt (36.2%). Jordan recorded a moderate percentage of respondents accessing healthcare, and their figure stood at 47.5%. Geographical and national factors appear to be influential in accessing healthcare.

Chi-square testing showed a statistically significant relationship between the respondent's country and risk of NCDs, χ^2 (4, N=400) = 30.10, $p < .001$. Prevalence of NCD risk significantly varied between five countries.

Table 1: Demographic Profile and Descriptive

Variable	Category	N	%
Country	Egypt	80	20
	Saudi Arabia	80	20
	Jordan	80	20
	Morocco	80	20
	United Arab Emirates	80	20
Age Group	18–24 years	85	21.3
	25–34 years	79	19.8
	35–44 years	68	17
	45–54 years	88	22
	55 years and above	80	20
Gender	Male	191	47.8
	Female	209	52.3
Residence	Urban	187	46.8
	Rural	213	53.3
Marital Status	Single	125	31.3
	Married	132	33
	Divorced/Widowed	143	35.8
Education Level	No formal education	78	19.5
	Primary education	83	20.8
	Secondary education	86	21.5
	University degree	69	17.3
	Postgraduate degree	84	21
Employment Status	Employed	98	24.5
	Unemployed	89	22.3
	Homemaker	75	18.8
	Retired	56	14
	Student	82	20.5
Income Level	Low income	54	13.5
	Lower-middle income	83	20.8
	Middle income	109	27.3
	Upper-middle income	92	23
	High income	62	15.5
Housing Type	Owned house/apartment	100	25
	Rented house/apartment	106	26.5
	Shared accommodation	97	24.3
	Other	97	24.3
Healthcare Access	No	207	51.7
	Yes	193	48.3
NCD Risk	No	207	51.7
	Yes	193	48.3
Assets Count	Mean (SD)	3.73	-1.62

Table 2: Country-Wise Comparison of Healthcare Access

Country	No, n (%)	Yes, n (%)	Total, n
Egypt	51 (63.8)	29 (36.2)	80
Saudi Arabia	52 (65.0)	28 (35.0)	80
Jordan	42 (52.5)	38 (47.5)	80
Morocco	33 (41.3)	47 (58.8)	80
United Arab Emirates	29 (36.3)	51 (63.8)	80
Total	207 (51.7)	193 (48.3)	400

Pearson $\chi^2(4, N = 400) = 21.49$, $p < .001$.

Table 3: Country-Wise Comparison of NCD Risk

Country	No, n (%)	Yes, n (%)	Total, n
Egypt	27 (33.8)	53 (66.3)	80
Saudi Arabia	30 (37.5)	50 (62.5)	80
Jordan	45 (56.3)	35 (43.8)	80
Morocco	51 (63.8)	29 (36.3)	80
United Arab Emirates	54 (67.5)	26 (32.5)	80
Total	207 (51.7)	193 (48.3)	400

Pearson $\chi^2(4, N = 400) = 30.10$, $p < .001$.

Table 3: Multicollinearity Analysis

Predictor	Tolerance	VIF
Age Group	0.984	1.016
Gender	0.982	1.018
Residence	0.994	1.007
Marital Status	0.98	1.02
Education Level	0.983	1.018
Employment Status	0.979	1.022
Income Level	0.981	1.02
Housing Type	0.985	1.015
Assets Count	0.975	1.026

Egypt (66.3%) and Saudi Arabia (62.5%) demonstrated the highest share of respondents with NCD risks, while Jordan (43.8%) was third in terms of this indicator. At the same time, Morocco (36.3%) and the UAE (32.5%) presented the lowest share of respondents with the studied health condition. It can be concluded that different demographic, socioeconomic, medical, and behavioral characteristics associated with country can influence NCD risk. On the whole, Egyptian and Saudi respondents were exposed to higher NCD risks than Moroccan and UAE respondents.

The findings on multicollinearity suggest that there are no issues of multicollinearity in terms of the independent variables used in the model. The values of tolerance were between 0.975 and 0.994, which is far higher than 0.10 (generally considered as a cut-off point), and therefore all the independent variables have contributed uniquely to the model. Likewise, the values of Variance Inflation Factor (VIF) were found to be between 1.007 and 1.026, which again is considerably lower than 5.0. This shows that none of the independent variables was correlated to one another, and hence their regression coefficients could be estimated correctly.

According to the binary logistic regression output (Table **4**), socio-demographic variables had significant

Table 4: Binary Logistics Analysis

	Model 1: Healthcare Access		Model 2: NCD	
	Odds Ratio (OR)	P-value	OR	P-value
Age Group		0.000		0.000
Age Group(1)	4.254	0.001	1.388	0.427
Age Group(2)	10.102	0.000	2.148	0.074
Age Group(3)	9.936	0.000	7.634	0.000
Age Group(4)	16.914	0.000	8.977	0.000
Gender(1)	2.817	0.000	0.521	0.012
Residence(1)	2.496	0.001	0.289	0.000
Marital Status		0.019		0.016
Marital Status(1)	1.035	0.914	1.79	0.072
Marital Status(2)	2.251	0.012	2.553	0.004
Education Level		0.000		0.003
Education Level(1)	1.672	0.209	0.512	0.099
Education Level(2)	4.119	0.001	0.609	0.227
Education Level(3)	6.887	0.000	0.325	0.008
Education Level(4)	6.19	0.000	0.213	0.000
Employment Status		0.001		0.000
Employment Status(1)	1.816	0.120	1.953	0.085
Employment Status(2)	1.945	0.094	2.24	0.042
Employment Status(3)	2.957	0.013	3.696	0.002
Employment Status(4)	5.376	0.000	7.603	0.000
Income Level		0.000		0.002
Income Level(1)	1.361	0.512	0.451	0.075
Income Level(2)	4.706	0.001	0.404	0.034
Income Level(3)	4.391	0.001	0.289	0.006
Income Level(4)	9.659	0.000	0.135	0.000
Housing Type		0.002		0.000
Housing Type(1)	1.506	0.254	1.409	0.352
Housing Type(2)	2.347	0.021	5.055	0.000
Housing Type(3)	4.07	0.000	4.983	0.000
Assets Count	1.399	0.000	0.679	0.000
Constant	0	0.000	2.083	0.297

effects on healthcare access and non-communicable diseases (NCDs) risk. In Model 1 for Healthcare Access, age was a significant determinant, with older people having considerably higher odds of accessing healthcare services than those from the reference group. Respondents in Age Group 55+, for instance, were 17 times more likely to have access to healthcare services than the reference group (OR = 16.91, $p < .001$). Another variable with a significant effect on healthcare access was gender. Compared to women, male respondents had considerably higher odds of having access to healthcare services (OR = 2.82, $p < .001$). Other variables that had significant effects included living in urban areas and being educated.

Regarding NCD Risk (Model 2), age had significant associations with NCD risk for age groups 45-54 years and 55+ years (OR = 7.63 and OR = 8.98, respectively, $p < .001$). Gender and residence had inverse association with increased odds for NCD risk, where odds of having NCD risk are smaller for gender and residence (OR = 0.52, $p = .012$; OR = 0.29, $p < .001$). Increased educational level was linked to reduced NCD risk, where the postgraduate category had a significantly lower chance of having NCD risk of approximately 79% compared to other education level categories (OR = 0.21, $p < .001$). Likewise, increased income was significantly linked with reduced NCD risk whereas selected employment and residential

Table 5: Model Fit for Model 1 and 2

Statistic	Model 1	Model 2
Omnibus χ^2	165.714	167.89
Df	24	24
P	< .001	< .001
-2 Log Likelihood	388.314	386.138
Cox & Snell R^2	0.339	0.343
Nagelkerke R^2	0.452	0.457
Hosmer-Lemeshow χ^2	4.342	3.489
Hosmer-Lemeshow p	0.825	0.9
Classification Accuracy (%)	75.5	76.3

Table 6: Moderating Role of Gender

	Model 3: Healthcare Access		Model 4: NCD	
	OR	P-value	OR	P-value
Age Group		0.026		0.442
Age Group (1)	4.509	0.005	0.968	0.950
Age Group (2)	10.673	0.002	1.011	0.988
Age Group (3)	10.901	0.019	2.526	0.335
Age Group (4)	19.14	0.019	2.138	0.531
Gender (1)	5.598	0.295	0.069	0.056
Residence (1)	3.627	0.131	0.215	0.081
Marital Status		0.017		0.010
Marital Status (1)	1.033	0.919	1.826	0.065
Marital Status (2)	2.297	0.011	2.766	0.002
Education Level		0.000		0.002
Education Level (1)	1.673	0.215	0.518	0.112
Education Level (2)	4.005	0.001	0.579	0.188
Education Level (3)	6.947	0.000	0.312	0.007
Education Level (4)	6.069	0.000	0.198	0.000
Employment Status		0.001		0.000
Employment Status (1)	1.795	0.131	1.903	0.102
Employment Status (2)	1.984	0.086	2.263	0.042
Employment Status (3)	2.922	0.015	3.653	0.003
Employment Status (4)	5.374	0.000	7.844	0.000
Income Level		0.051		0.363
Income Level (1)	1.687	0.363	0.382	0.088
Income Level (2)	7.604	0.013	0.284	0.118
Income Level (3)	8.703	0.048	0.17	0.104
Income Level (4)	24.49	0.023	0.066	0.059
Housing Type		0.703		0.098
Housing Type (1)	1.513	0.454	1.443	0.497
Housing Type (2)	2.375	0.322	5.259	0.052
Housing Type (3)	3.914	0.255	5.378	0.165
Assets Count	1.282	0.363	0.519	0.021
Gender X AGE	0.98	0.914	1.271	0.203
Gender X income level	0.858	0.470	1.123	0.591
Gender X Housing type	1.005	0.982	0.996	0.986
Gender X Assets count	1.059	0.737	1.182	0.339
Gender Residence	0.787	0.651	1.235	0.699
Constant	0	0.000	2.607	0.302

Table 7: Model Fit for Model 1 and 2

Statistic	Model 3	Model 4
Omnibus χ^2	166.522	171.737
Df	29	29
P	< .001	< .001
-2 Log Likelihood	387.506	382.291
Cox & Snell R^2	0.341	0.349
Nagelkerke R^2	0.454	0.466
Hosmer-Lemeshow χ^2	7.467	6.54
Hosmer-Lemeshow p	0.487	0.587
Classification Accuracy (%)	75	77.5

categories had increased chances of NCD risk. Higher assets count was associated with decreased NCD risk (OR = 0.68, p < .001), implying that wealth is an important protective factor.

According to the logistic regression model fit statistics, both models exhibited excellent prediction of the outcomes. The significance of the Omnibus Tests in the two models showed that the predictors had contributed significantly to model fit relative to the null model with chi-square values of 165.714 and 167.890 at p<.001 for Models 1 and 2 respectively. The values for Nagelkerke R^2 for both models 0.452 and 0.457 respectively show that about 45 percent of the variance in health care accessibility and NCDs were predicted using the predictors. Non-significant results from Hosmer-Lemeshow tests (p = .825; p = .900) indicated adequate model fitness. In addition, classification accuracy levels of 75.5 percent and 76.3 percent were attained in the two models respectively.

The purpose of the moderation analysis was to see if gender moderated the impact of the socio-demographic factors on Health Care Access (Model 3) and NCD risk (Model 4). The significance of the model regarding Health Care Access persisted, but only age, marital status, education, employment status, and income turned out to remain significant predictors. Respondents who belonged to the Age Group 55+ had a 19 times higher odds of having access to health care services than Age Group 25-34 (OR = 19.14, p = .019). Similarly, other socio-demographic factors like education, employment status, and income positively affected health care access. However, none of the interaction terms was statistically significant for all four models (p > .05).

As far as NCD Risk is concerned, again the findings are similar as only marital status, education, employment status, and asset count remained significant predictors. While education and assets negatively associated with NCD risk, certain groups of employment were positively associated with NCD risk. Most important of all, all interaction terms between these two independent variables are statistically insignificant (p > .05). Hence, it is possible to argue that there is no gender difference regarding their relationships with health risk.

According to the model fit indices, both moderation models showed an appropriate fit. The Omnibus Tests for Models 3 (χ^2=166.522, df = 29, p<.001) and Model 4 (χ^2 =171.737, df = 29, p<.001) were found to be significant, indicating that the predictor variables and their interactions enhanced the models' predictive accuracy compared to the null models. The model fits seem to be acceptable due to the fact that the Hosmer-Lemeshow Tests were insignificant (p=.487 and p=.587). Moreover, the models seemed to explain about 45-47% of variance in healthcare access and NCDs risk, considering the Nagelkerke R^2 indices (0.454 and 0.466, correspondingly). Furthermore, the classification accuracies reached 75.0% and 77.5% for Models 3 and 4, respectively.

ROC graph in Figure **1** highlights how well the logistic regression model discriminates between individuals who have and do not have the dependent variable. From the graph, the ROC curve is located above the reference diagonal line, meaning the regression model outperforms chance in its classification of respondents. With an area under the curve of 0.843, the model shows good discriminatory ability, with a range of 0.80 to 0.90 usually implying good model performance.

With an AUC of 0.843, there is an 84.3% chance that the model will be able to assign a larger probability score to a randomly selected person with the event compared to another individual without the event. As can be seen from the ROC curve, there is also a good trade-off between sensitivity and specificity at various

threshold levels of prediction. In summary, it is evident from the results that the model has high predictive accuracy and can be used to classify respondents based on the dependent variable of the study.

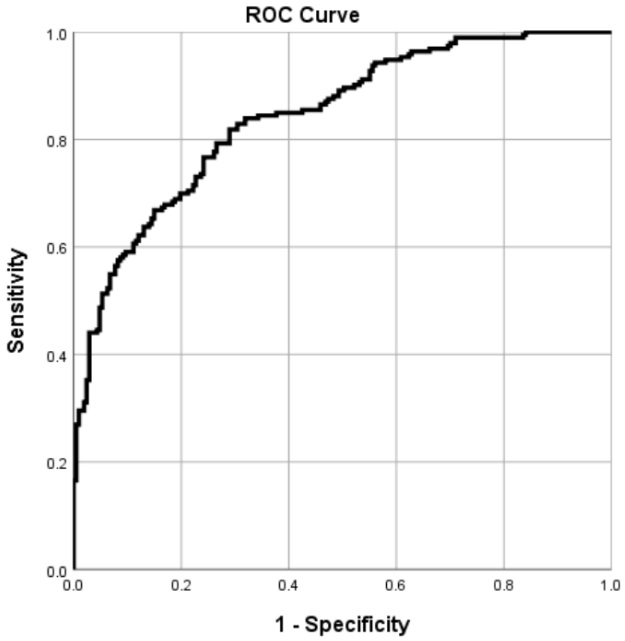

Figure 1: ROC Curve for Healthcare Access.

It can be observed from the ROC curve in Figure **2** that the logistic regression model possesses a very effective discriminating power among those respondents with or without the studied outcome. The ROC curve is consistently situated higher than the straight line of no discrimination, implying that the model demonstrates significantly more effective results compared to pure chance. Moreover, the rather rapid increase in the sensitivity at a low level of the false-positive rate proves that the model demonstrates its ability to predict the majority of cases in a proper manner. In turn, approaching the point of coordinates zero in terms of false-positive and true-positive rate testifies about the sufficient discriminative abilities of the model.

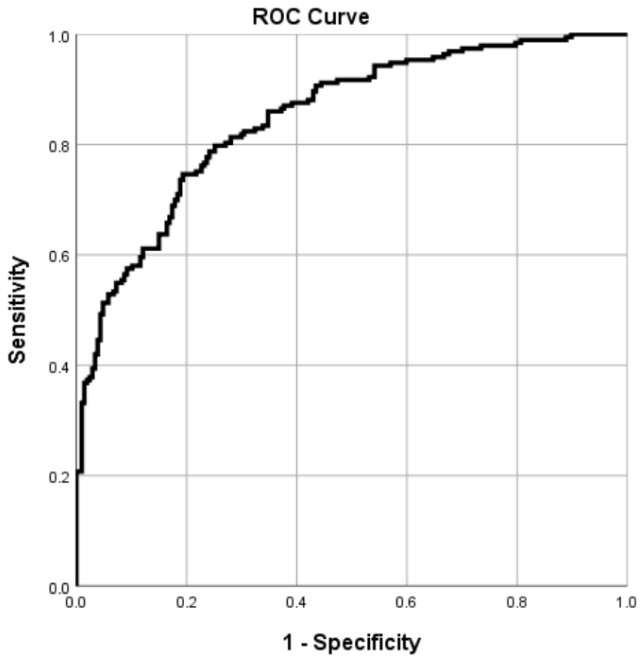

Figure 2: ROC Curve for NCD Risk.

The value of AUC is 0.849 indicating that there are 84.3% chance that the model is able to assign a larger probability score to randomly selected person with the NC risk compared to another individual without NCD. Hence, there is a good trade-off between sensitivity and specificity at various prediction thresholds.

4. DISCUSSION

This research analysed the determinants of health care access and NCD risk among adults living in Egypt, Saudi Arabia, Jordan, Morocco, and UAE, which are five Arab countries. The results of the study showed great cross-country disparities in health care access and NCD risk, as well as the considerable influence of socio-demographic and socioeconomic factors on these indicators. Moreover, the moderation effect of gender was evaluated and it was found out that gender had no moderating effect on the relationships between socioeconomic variables and health indicators. These results can be regarded as important for understanding of health inequalities among Arab countries.

Country-level differences in access to healthcare facilities were significant. People from the UAE and Morocco enjoyed significantly better access to healthcare facilities compared to people from Egypt and Saudi Arabia. This is explained by the difference in healthcare system infrastructure, health financing systems, insurance, and healthcare policies. A country with a better healthcare system will have greater healthcare access, greater continuity, and preventive services, making healthcare access easier for its citizens. In earlier studies, it was found that access to healthcare facilities is dependent on the healthcare system and level of development of an economy [21] also indicated the disparities in the healthcare access in Egypt. There are challenges related to overcrowding, restricted resources and long waiting times. People living in remote or underserved areas lack access to specialised care. [22] has also noted such disparities across middle eastern which affirms the findings obtained in this study.

In the same vein, substantial differences were noted for NCD risk among different countries. The highest NCD risk was found in Egypt and Saudi Arabia, while Morocco and the UAE had relatively low levels of NCD risk. This observation agrees with previous studies which have shown that there are several factors

contributing to an increased NCD risk, including lifestyle, behavioural, environmental, and socioeconomic factors. There may be disparities in dieting behaviour, levels of physical activities, smoking habits, levels of obesity, access to health care services, and health-related policies implemented that may lead to differences in NCD risk levels among different countries [1].

One of the key predictors of health access and NCD risk was found to be the age factor. Indeed, respondents in an advanced age cohort showed higher chances of health care access and NCD risks compared to their younger counterparts. One can expect such higher chances of health care access among older respondents due to higher health-related needs, higher probability of chronic diseases, and higher contacts with health care facilities. At the same time, significantly higher chances for NCD risk among respondents aged 45 years and older confirm epidemiological evidence on the relationship between the probability of developing chronic disease and age. It is explained by the fact that with the increase in age, a person gets increasingly exposed to behavioural and metabolic risk factors leading to the development of chronic diseases. This pattern has been confirmed by [2, 3, 18].

While promoting education as a protection against NCD risk, there was also observed an improvement in access to healthcare services. Individuals who had received university-level education and further pursued postgraduate courses had much lower chances of developing NCDs as opposed to their less educated counterparts. In accordance with past literature, individuals with education have more health literacy, better understanding of how diseases could be prevented, and adopt better lifestyles. According to [2], people who receive higher education were more engaged in preventive healthcare measures and avoided NCD risk factors. Furthermore, educated individuals have access to more health information, better understanding of healthcare systems, and sufficient financial resources for maintaining healthy living.

Finally, income and wealth variables played key roles in shaping individuals' health situations. As was discussed above, higher income and assets increased access to healthcare and reduced NCD risks. Such results correspond to the idea of social determinants of health, as the theory states that economic resources are the key factors in healthy living, accessing healthcare services, and disease prevention. People with larger incomes can afford themselves healthcare visits, health insurance, healthy foods, and environments. The findings are consistent with prior studies conducted by [19,20] on the association between lower socioeconomic status and greater clustering of behavioural risk factors for NCDs.

The impact of place of residence was also significant in predicting health indicators. Individuals who lived in urban areas had better access to healthcare services as well as lower risks of having NCDs. These results can be attributed to differences in healthcare facilities and professionals, as well as availability of transportation and preventive services. People living in rural communities tend to have barriers in accessing healthcare, such as poor geographic location, which may result in late diagnosis and prevention of diseases leading to increased risks of having NCDs.

The most important finding in this study involves the role of gender as a moderating factor. While gender significantly predicted access to healthcare and risks of NCDs in the direct-effects models, the results of the moderation analysis show that gender significantly moderated neither of these relations. There was no interaction term between gender and age, income, residence, housing type, and assets ownership that was statistically significant. Thus, socioeconomic predictors of health indicators affected men and women equally.

This result is especially interesting, considering that it contradicts most of the findings in the previous researches. The literature suggests that gender differences can significantly impact the results related to behavioural risk factors and NCDs' outcomes. For instance, [23] found a high level of clustering of risky behaviours in men; moreover, [13] identified the gender factor as a crucial determinant of NCD risk factors. On the other hand, it seems that socioeconomic factors are more likely to impact the health outcomes in Arab countries countries than gender itself.

There can be several reasons for such an outcome. First, there is a tendency in many Arab countries that their healthcare system is trying to focus on the entire population without differentiating the genders anymore, which impacts the differences between men and women in the accessing healthcare services [21]. In addition, since the socioeconomic determinants have the same effect on both genders, when the variables such as income, occupation, housing, education, etc., are taken into account, the impact of the gender difference becomes insignificant. Finally, changes related to economy and education of women contribute to such results [24-27].

The lack of moderation effect has significant contributions to the literature as it defies the commonly

held belief that gender plays a role in modifying the effects of the socioeconomic determinant on health outcomes. On the contrary, the study suggests that socioeconomic inequalities are stronger determinants of healthcare accessibility and NCD risk compared to gender differences. Such a contribution is significant due to the fact that current research tends to focus mainly on the gender differences while overlooking the question on whether gender moderates the effects of social determinant on health outcomes. As such, future interventions should consider focusing on socioeconomic improvement, education, reduction in poverty levels and increased access to healthcare services as opposed to gender-based interventions [28, 29].

To conclude, healthcare accessibility and NCD risk depend on several socioeconomic factors including age, education, income, occupation, place of residency and assets. Gender does not play a significant role in moderation of the aforementioned factors in terms of health outcomes. Interventions aimed at increasing healthcare accessibility, socioeconomic improvements and preventive healthcare services have huge potentials to produce positive results for the Arab countries.

5. CONCLUSION

In this research, the factors affecting healthcare access and NCD risks among adult members of Egypt, Saudi Arabia, Jordan, Morocco, and the UAE have been analysed. It has become apparent that there is a considerable variation in relation to the above variables based on different national settings. Respondents belonging to the UAE and Morocco had relatively high healthcare access and low risk of NCDs while those from Egypt and Saudi Arabia had higher NCD risk and poor healthcare access.

Based on the logistic regression analysis, it has emerged that the variables affecting health care access and risk of NCD include age, education, occupation, income, location, housing, and asset ownership. It has come out that older persons had relatively high chances of using health care services but they had significantly high risk of suffering from NCDs. Similarly, persons having more years of education, high income, and many assets had relatively better access to healthcare facilities than those with less income and assets. Similarly, urban residents had higher access to healthcare services than rural residents.

A notable aspect of this research is the investigation of gender as a moderator. Although gender proved to be directly related to access to healthcare facilities and NCD risk, the results of moderation analysis indicated no significant impact of gender on the relationship between socioeconomic determinants and the health outcomes studied. This implies that structural determinants like education, income, employment, and wealth have a greater impact on healthcare access and NCD risk compared to gender.

On the whole, this research demonstrates how important socioeconomic inequality is as a determinant of health outcomes across the Arab countries. The development of effective policies targeted at increasing access to education, closing income gaps, and building a solid healthcare system will undoubtedly help address the issue of NCD prevalence and increase overall health care accessibility.

PRACTICAL IMPLICATIONS

The results of this study have great importance from an implementation perspective for policy makers, medical professionals, and public health administrators in all Arab countries. Considering that socioeconomic factors play a key role in affecting the availability of healthcare services and developing NCDs, efforts must be made by governments to mitigate socioeconomic disparities and increase accessibility of healthcare facilities to those in need. In addition, health education programs and preventive care must be promoted and increased access to healthcare services. Another important point highlighted in the results is the need to adopt a country-specific strategy based on the observed differences between the countries included in the study. Elderly people who carry a high risk of NCDs should also receive special attention.

THEORETICAL CONTRIBUTION

An important theoretical contribution of this paper involves the refutation of the idea that gender moderates the impact of socioeconomic variables on health indicators. While there have been numerous studies and health-related theories that assume that men and women experience different levels of access to healthcare and NCD risk depending on social role differences, health-related behaviour and access to resources, this research indicates that none of the gender interaction effects were statistically significant either for healthcare access or NCD risk. Thus, this means that the impact of age, education level, income, employment status, quality of housing, place of residence and possession of assets influences men and women in the same way in the selected Arab countries.

In other words, this means that socioeconomic variables can be more impactful on both of these dependent variables as compared to gender. Therefore,

gender disparity in terms of health outcomes is likely to become less pronounced once the greater socioeconomic inequality has been addressed. In conclusion, it should be said that this research makes an important contribution to health inequality theories as well since it challenges the idea of the universal moderating effect of gender.

LIMITATIONS AND FUTURE DIRECTION

There are some constraints in the current study, which should be taken into consideration while interpreting the results. Firstly, the research is based on a cross-sectional design that does not allow determining any causal relationship among socioeconomic factors, access to healthcare and NCDs risk. Secondly, as the data was collected through a survey, there could have been both recall and social desirability bias influencing the accuracy of information concerning respondents' health status and healthcare access. Thirdly, although respondents came from different Arab countries, the results obtained might not reflect the general situation in the region due to various healthcare, social, and economic characteristics of particular countries. Fourthly, NCD risk in the study was estimated via survey-based indicators instead of clinical diagnoses. Furthermore, the study employed convenience sampling through online platforms that resulted in selection bias by disproportionately recruiting participants with internet access, higher educational attainment, and greater health awareness.

For future research, the following directions should be followed. Researchers should use the longitudinal design in order to explore the role of healthcare access and socioeconomic factors in shaping the development of NCDs and identify possible causal relationships. In addition, researchers can consider using other approaches, such as clinical and biometric health measures, in order to estimate NCDs more accurately. Moreover, researches in future can also explore other variables that might moderate the relation between NCDs and health care access, such as health literacy, cultural beliefs, health care system quality, and health insurance coverage.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest related to this study.

FUNDING DECLARATION

No funding was received for this study**.** The research was conducted independently using survey questionnaire. The authors did not receive any financial support from funding agencies, commercial organizations, or not-for-profit sectors for the design, analysis, or publication of this research.

APPENDIX A: SURVEY QUESTIONNAIRE

Section A: Demographic Characteristics

A1. Age

- 18–24 years
- 25–34 years
- 35–44 years
- 45–54 years
- 55 years and above

A2. Gender

- Male
- Female

A3. Country of Residence

- Egypt
- Saudi Arabia
- Jordan
- Morocco
- United Arab Emirates

A4. Place of Residence

- Urban
- Rural

A5. Marital Status

- Single
- Married
- Divorced/Widowed

A6. Education Level

- No formal education
- Primary education
- Secondary education
- University degree
- Postgraduate degree

A7. Employment Status

- Employed
- Unemployed

- Homemaker
- Retired
- Student

Section B: Socioeconomic Status (SES)

B1. Monthly Household Income

- Low income
- Lower-middle income
- Middle income
- Upper-middle income
- High income

B2. Type of Housing

- Owned house/apartment
- Rented house/apartment
- Shared accommodation
- Other

B3. Which of the following household assets do you currently have?

(Select all that apply)

- Refrigerator
- Internet access
- Private car
- Air conditioning
- Computer/tablet
- Smart television

Section C: Healthcare Access

C1. Have you visited a healthcare facility for a routine health check-up during the last 12 months?

- Yes
- No

C2. Have you undergone preventive screening (blood pressure, blood glucose, cholesterol, etc.) during the last 12 months?

- Yes
- No

Section D: Non-Communicable Disease (NCD) Risk Factors

D1. Do you currently smoke cigarettes, shisha, or any other tobacco products?

- Yes
- No

D2. Do you engage in at least 150 minutes of moderate physical activity per week?

- Yes
- No

D3. Do you consume at least five servings of fruits and vegetables per day?

- Yes
- No

D4. Do you consume sugary drinks, sweets, or highly processed foods three or more times per week?

- Yes
- No

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Received on 06-04-2026 Accepted on 08-05-2026 Published on 18-06-2026

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