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Research Article

Non-communicable diseases and their associated risk factors among staff members of Minia University

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Abstract

Background: non-communicable diseases are preventable diseases that are currently the leading causes of death in Egypt. Non-communicable diseases and their related risk factors represent a significant burden on the individuals and the health system in Egypt. **Aims of study:** Detection of the frequency of non-communicable diseases and their associated risk factors among staff members of Minia University. **Methods:** This study is a cross sectional study conducted for detection of the frequency of non-communicable diseases and their associated risk factors among staff members of Minia University.240 participants were included in the study, using administered questionnaire which included demographic characteristics. Weight, height, blood pressure, cholesterol level, HA1c and random blood sugar were measured. Also, kidney function tests, serum albumin and urine analysis were done. BMI was calculated as weight (kg) divided by the square of height (m^2). **Results:** The frequency of chronic kidney disease (CKD) among staff members of Minia University was 92.5%. Nearly two thirds of CKD patients were males while one third was female. Also, the current study demonstrated a relation between CKD with systolic blood pressure (SBP) and hypercholesterolemia. The frequency of CKD increased with age. The frequency of diabetes mellitus (DM) among staff members of Minia University was 42.9%. There was a significant relation between DM and SBP. While the frequency of hypertension was 75.4%. It was more prevalent in males than in females. **Conclusions:** The frequency of CKD among staff members of Minia University was 92.5%. Frequency of DM was 42.9%. Nearly three-quarters of participants had hypertension.

Keywords: Risk factors, non-communicable, Minia University.

Introduction

Non-communicable diseases (NCDs), which account for 71% of all deaths worldwide, are the main cause of mortality. Notably, type 2 diabetes (T2D), cancer, respiratory diseases, and cardiovascular disease account for 80% of all NCD deaths, with yearly mortality rates of 1.6, 9.0, 3.9, and 17.9 million, respectively. Infectious illnesses and NCDs are both having a devastating impact on Africa. However, it is anticipated that by 2030, mortality in Africa from NCDs will outnumber those from communicable, maternal, perinatal, and nutritional illnesses put together. In addition, it is predicted that within the next ten years, Africa will account for more than 70% of all cancer-related fatalities worldwide. To stop the spread of this NCD epidemic, urgent solutions are needed. (1)

There are numerous variables that can raise the likelihood of developing NCDs, and they can be categorized in various ways. In one method, risk factors are categorized as either modifiable or non-modifiable factors, depending on whether they are subject to change or not. Additionally, risk factors can be divided into three categories: (I) biological factors, including

being overweight, dyslipidemia, hyper-insulinemia, and hypertension; (II) behavioral factors, including diet, inactivity, smoking, and alcohol use; and (II) societal factors, which include complicated combinations of interrelated socioeconomic, cultural, and environmental factors [2].

Prevention of non-communicable diseases includes multiple levels, including primordial, primary, secondary, and tertiary preventions. Primordial prevention can be accomplished at any age. The health of mothers before and during pregnancy affects the likelihood that children may develop NCDs later in life. This approach is crucial for preventing NCDs since it goes after the source of the issue. [3]

A susceptible population or person is the target of primary preventative strategies. Primary prevention aims to stop a disease before it ever starts. Thus, its intended audience consists of healthy people. To stop a disease from progressing in a vulnerable individual to subclinical disease, actions that restrict risk exposure or boost the immune system of those at risk should be implemented. As an illustration, vaccinations are an example of primary prevention.

Secondary prevention targets healthy-appearing people with subclinical disease states and stresses early illness identification. Pathologic alterations make up the subclinical disease, although there are no overt symptoms that can be identified during a doctor visit. Screening is a common technique for secondary prevention[5]

Tertiary prevention focuses on the disease clinical and outcome stages. It is used on symptomatic individuals with the intention of lessening the intensity of the illness as well as any potential aftereffects. Tertiary prevention strives to lessen the impact of the disease once it has been established in a person, whereas secondary prevention aims to prevent the beginning of illness. Rehabilitation initiatives are frequently used as tertiary preventative strategies. [6]

The aim of the study is:

- Detection of the frequency of non-communicable diseases among staff members of Minia University.
- Determining risk factors for non-communicable diseases among staff members of Minia University.

Subjects and methods

This cross-sectional study was conducted among staff members at Minia University, Minia, Egypt, during the period from April 2022 to September 2023. The study setting was the renal outpatient clinic. All staff members of Minia University were invited to participate in the study. The required sample was calculated based on the statistical software EPI-INFO version 3, considering the frequency of chronic kidney diseases in Egypt (10%) [7], a confidence interval of 95%, and a maximum acceptable error of 5%. Accordingly, the minimum sample size needed was 134 members; however, to increase the validity and power of the study, we tried to increase the sample size. A total of 240 members (96 from medical faculties and 144 from non-medical faculties) were included in the study.

Data collection

Participants were informed about the study through university-wide announcements and email invitations. Various departments within the university were contacted to extend invitations for participation in the study. Staff members who expressed interest and willingness to volunteer for the study during these meetings were screened for eligibility criteria. A convenient date and time for data collection were then scheduled with each participant.

Participants were subjected to an interview questionnaire that included demographic characteristics including age, gender, and type of college. Also, medical history was taken, including recent diseases, drugs, and family history of diseases such as diabetes mellitus and cancer. Height in stocking feet and weight in light clothing were measured. BMI was calculated as weight (kg) divided by the square of height (m^2). A digital scale was used for the measurements. Brachial blood pressure was measured using a standard mercury sphygmometer. A blood sample was collected to measure random blood sugar, HA1c, serum creatinine, blood urea, blood urea nitrogen (BUN), and serum albumin**.** Also, a urine

analysis was done. All samples were analyzed at the university's accredited laboratory.

Statistical analysis

The collected data was presented by tables and graphs, computerized, and statistically analyzed using IBM Statistical Package of Social Sciences version 27 (SPSS 27). All the data collected were given serial numbers. The data was entered and checked for data entry errors. Data were expressed as mean±SD, minimum and maximum of range for quantitative parametric measures, in addition to both number and percentage for categorized data. The relation of each variable to outcome categories was separately tested by the chi-square or Fisher's exact test for categorical variables and independent sample t test and ANOVA test for numerical variables**.**

Ethical consideration:

Before data collection an informed written consent was taken from the participants. The study protocol was approved by the Ethics Committee of Faculty of Medicine, Minia University.

Results

Table (1): shows that 240 participants were included in the present study, 60%(59.6%) were males and 40% (40.4%) were females, with a mean age of 47.3 (SD=12.1). The percentage of participants aged more than 50 years was the highest, followed by members aged 41–50 years, while the least percentage was for persons aged less than 30 years. The mean weight was 82.3 kg (SD=17.5) and the mean height was 1.7 m (SD=0.09). Regarding BMI, the mean was 28.6 (SD = 5.6).

Table (2): This table shows that the mean of SBP was 151.1 (SD = 18.1), but it was 85.5 (SD = 10.8) for DBP, while the mean of MAP was 107.4 (SD = 11.6). The mean cholesterol level was 207.13 (SD = 41.9).

Table (3): shows that there was a significant association between age groups and CKD ($p < 0.001$). The higher the age, the higher the frequency of CKD. Nearly half of CKD patients were over 50 years old, while 30% were in the age group of 41 to 50. The sex of the participants was also significantly associated with CKD ($p < 0.001$). About 63.5% of CKD patients were males, compared to 36.5% for females. In addition, there was a significant relationship between CKD and SBP ($p = 0.02$). Also, there was a significant relationship between CKD and hypercholesterolemia ($p = 0.04$). The frequency of CKD among hypercholesterolemic patients (72%) was higher than that of normal cholesterol individuals (28%).

As shown in table (4): there is a significant association between DM and SBP ($p = 0.03$). There is no significant difference between diabetics and non-diabetics with regard to age, sex, DBP, MAP, obesity, or hyper-cholesterolemia. ($p = 0.5, 0.4, 0.6, 0.1, 0.9$, and 0.8, respectively)

Table (5): shows there is a significant difference between hypertensives and normal individuals with regard to sex ($p= 0.005$). Nearly two-thirds of hypertensives are males, while one-third of them are females. No significant associations are found between both groups regarding age, BMI, and hyper-cholesterolemia. ($p= 0.8, 0.2$ and 0.1, respectively)

Table 1: Sociodemographic characteristics and anthropometric measurements of the studied staff members at Minia university, 2023:

	Total
	(N=240)
Sex	
Male	143 (59.6%)
Female	97 (40.4%)
Age groups	
<30	27(11.3%)
31-40	41 (17.1%)
41-50	68(28.3%)
>50	104(43.3%)
Age (years)	
Mean ±SD	47.3±12.1
(Range)	(22-76)
Weight (Kg)	
Mean ±SD	82.3±17.5
(Range)	50-130
Height(m)	
Mean ±SD	1.7±0.09
(Range)	1.47-1.93
BMI (kg/m^2)	
Mean ±SD	28.6±5.6
(Range)	17.4-43.3
Faculty	
Medical	96(40%)
Non-medical	144(60%)

Table 2: Blood pressure measurements and laboratory investigations of staff members of Minia University, 2023:

	Total
	(N=240)
SBP (mmHg)	
Mean±SD	151.1±18.1
(Range)	110-214
DBP (mmHg)	
Mean±SD	85.5±10.8
(Range)	52-139
MAP (mmHg)	
Mean±SD	107.4±11.6
(Range)	83-164
Cholesterol level (mg/dl)	
Mean±SD	207.13 ± 42.93
(Range)	21-392

SBP= systolic blood pressure, DBP= diastolic blood pressure, MAP= mean arterial blood pressure**.**

Table (3): The relation between CKD and different variables in staff members of Minia University (N=240), 2023:

	CKD		Test	p value
	Normal kidney	CKD		
Age groups < 30 31-40 41-50 >50	 13(72.2%) 5(27.8%) 0(0.0%) 0(0.0%)	 14(6.3%) 36(16.2%) 68(30.6%) 104(46.8%)	χ^2 (79.55)	<0.001*
Sex Female Male	 16(88.9%) 2(11.1%)	 81(36.5%) 141(63.5%)	χ^2 (18.99)	<0.001*
Diabetes mellitus Yes No	 8(44.4%) 10(55.6%)	 95(42.8%) 127(57.2%)	χ^2 0.02	0.89
Blood pressure Hypertensive Normal	 12(66.7%) 6(33.3%)	 169(76.1%) 181(75.4%)	χ^2 0.80	0.4
SBP Mean ±SD	 141.44±20.38	 151.91±17.75	t=1.25	0.02*
DBP Mean ±SD	 81.11±6.98	 85.80±11.02	t=2.41	0.08
BMI Mean ±SD	 29.91±5.44	 28.45±5.62	t=0.07	0.29
Hypercholesterolemia Yes No	 17(94.4%) 1(5.6%)	 160(72.1%) 62(27.9%)	χ^2 4.31	0.04*

Table (4): The relation between diabetes mellitus and different variables in staff members of Minia University,2023:

	Non-diabetic	Diabetic	Test	p value
Age Mean ±SD	 48.42±11.648	 46.12±12.24	t=0.569	0.5
Sex Female Male	 52(38%) 85(62%)	 45(43.7%) 58(56.3%)	χ^2 0.802	0.4
SBP Mean ±SD	151.39±19.64	150.78±15.97	t=4.765	0.03*
DBP Mean ±SD	85.77±10.25	85.02 11.605	t=0.277	0.6
MAP Mean ±SD	107.66±11.93	106.94±11.11	t=2.811	0.095
Obesity Obese Non-obese	 95(70.9%) 39(29.1%)	 74(71.8%) 29(28.2%)	χ^2 0.02	0.9
Hypercholesterolemia Yes No	 102(74.5%) 35(25.5%)	 75(72.8%) 28(27.2%)	χ^2 0.081	0.8

Table (5): The relation between hypertension and different variables in staff members of Minia University, 2023:

	Normal	Hypertensive	Test	p value
Age Mean ±SD	47.73±13.14	47.33±11.55	t=1.02	0.8
Sex Female Male	33(55.9%) 26(44.1%)	64(35.4%) 117(64.6%)	χ^2 7.82	0.005*
BMI Mean ±SD	27.79±5.49	28.81±5.64	t=0.002	0.2
Hypercholesterolemia Yes No	48(81.4%) 11(18.6%)	129(71.3%) 52(28.7%)	χ^2 2.33	0.1

Discussion

In this study, the highest percentage of CKD patients was males (63.5%) while 36.5% of CKD patients were females and this was in line with the previous study which demonstrated that women were less likely to develop CKD.[8] This could be because of presence of estrogen. Numerous routes, such as enhanced metabolism, the selectivity of Angiotensin Type 2 (AT2) receptor signaling, reduced oxidative stress, and differential renin-angiotensin system (RAS) signaling, have been identified as ways in which estrogen may impact kidney function.[9]

High percentage of CKD in old age was observed in the present study. This outcome is consistent with a previous study which detected the decrease of GFR with age and that the prevalence of CKD is highest in older adults. By the end of the century, in countries with extended life expectancies, chronic kidney disease (CKD) will rank second in terms of causes of mortality and this is supported by the global population's progressive aging.[10]

We further reported the significant association between systolic blood pressure and CKD. Most patients with CKD have hypertension, which affects 67–92% of them. As kidney function declines, hypertension becomes more prevalent and severe[11]. When improper autoregulation permits the transfer of increased systemic pressures to the glomeruli, leading to glomerulosclerosis, hypertension can both cause and hasten renal damage. Because renal damage and loss of GFR hinder sodium excretion and increase salt sensitivity, hypertension can result[12].

This study showed that the frequency of DM in staff members of Minia University was 42.9%. The result of this study suggested that diabetes mellitus can occur at any age so there is no significant relation between DM and age. Regarding sex, the current study claimed that DM can occur to males and females without different susceptibility. These findings are similar to a meta-analysis of data from sub-Saharan Africa which revealed no variations in the likelihood of acquiring diabetes based on sex [(13)]. Other studies found a higher prevalence of type 2 diabetes among men than women [(14)].

These variations in results may be due to differences in the age groups included in the studies. According to certain studies, there are some intriguing variations in the incidence of type 2 diabetes between the sexes that change over the course of a person's life. Females have significantly higher rates of type 2 diabetes in their youth, while males have a significantly higher prevalence of the disease in their middle years. In later life, the rates are fairly similar for both sexes [(15)].

The present study suggested strong relationship between DM and hypertension, and this is in line with previous studies. Diabetes mellitus is linked to chronic vascular injury, which impairs the functioning of vascular smooth muscle and endothelial cells and is linked to dysregulation in the cardiovascular system. There is evidence that during diabetic mellitus (DM), purinergic

receptor distribution is changed, mainly in relation to endothelial and smooth muscle cells. This can have significant effects on vascular reactivity and vascular smooth muscle function. [16]

Although the present study stated that there was no significant relationship between DM and obesity, some studies don't agree with that. One of the primary causes of the rapid increase in the number of people with type 2 diabetes is the sharp rise in the prevalence of obesity across all ages. The ectopic expansion of adipose tissue and excessive accumulation of specific nutrients and metabolites hinder the metabolic balance through insulin resistance, dysfunctional autophagy, and the microbiome-gut-brain axis, resulting in an accelerated loss of β-cell function and a gradual elevation of blood glucose [17].

In this study, the frequency of hypertension was nearly 75%, and it was more in males. But in previous studies, hypertension was higher among women, and it's also linked to comorbid conditions including diabetes, heart disease, high cholesterol, being overweight, and obesity**.** Women are more likely than men to seek health care, which increases their chances of receiving a diagnosis. This could account for the higher prevalence in women [18].

Although the blood pressure and BMI relationship wasn't significant in this study, other studies demonstrated that blood pressure increases in parallel with the increase in body weight. Adipokines have significant effects on blood pressure (BP) elevation. Insulin resistance-related hyperinsulinemia promotes salt retention, boosts sodium reabsorption, and raises the volume of plasma in circulation. Additionally, hyperinsulinemia stimulates the SNS and the renin-angiotensin-aldosterone system (RAAS), which speeds up the hypertrophy of vascular smooth muscle cells and raises peripheral vascular resistance [19].

This study found no evidence of a significant association between hypertension and hypercholesterolemia. According to other research, the two most prevalent risk factors for cardiovascular illnesses that frequently co-occur are hypertension and hypercholesterolemia. Previous research has shown a positive correlation between blood pressure and total cholesterol (TC). The pathogenic impact of elevated cholesterol on peripheral vascular tone and the function of the tissue renin-angiotensin system could be the cause of this [20]**.** According to the present study, there was a significant relationship between hypercholesterolemia and age groups. This was in accordance with a prior study that demonstrated that aging is linked to a number of systemic body dysfunctions, including lipid metabolic disorders and chronic inflammatory states that exacerbate atherosclerotic cardiovascular disease (ASCVD) [21].

Conclusion

The frequency of CKD among staff members of Minia University was 92.5%. It was more in males than in females. Nearly two-thirds of CKD patients were male, while one-third were female. The frequency of CKD increased with age. Also, the current study demonstrated a relationship between CKD, SBP, and hypercholesterolemia.

The frequency of diabetes mellitus among staff members of Minia University was 42.9%. There was a significant relationship between DM and SBP. While The frequency of hypertension was 75.4%, and it was more prevalent in males than in females. The frequency of hypercholesterolemia was 73.8%. In this study, hypercholesterolemia was more in females. Nearly half of the participants who had hypercholesterolemia were aged over 50.

Recommendations:

- Public health screening programs for the early detection of non-communicable diseases
- Conducting health education about the risk factors of non-communicable diseases.
- Raising awareness of the importance of screening for non-communicable diseases for early detection and improvement of the outcome.

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