

Epidemiological Mapping of Hypertension, Diabetes Mellitus and Obesity among Menoufia Medical Students' Family Members

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Abstract:

Background: Hypertension (HT), type 2 diabetes mellitus (DM) and obesity are amongst the most common non-communicable chronic diseases in the developed and developing countries that have substantial economic burden. **Objectives:** To estimate the prevalence and describe the epidemiological mapping of hypertension, diabetes mellitus and obesity among Menoufia medical students' family members. **Methods:** A cross sectional study has been conducted on 13,782 family members of the students in the faculty of medicine, Menoufia University during the academic year 2018-2019. Participants were asked to complete a predesigned questionnaire including demographic profile (age, sex, and residence) and questions about hypertension, diabetes mellitus and obesity among their family members. **Results:** The prevalence rates of hypertension, diabetes and obesity were 12.3%, 7.05% and 11.7% respectively. Hypertension was more prevalent among males, older than 40 years and those living in urban areas, while diabetes was more prevalent among females, older than 40 years ($p < 0.001$) without association to residence. Elbagour, Tala and Shebin Elkom ranked the top 3 districts in Menoufia governorate to have hypertensive patients with 14.65%, 14.34% and 14.05% respectively. Diabetes mellitus was most prevalent in Ashmon (8.97), Berket Elsaba (8.10%), Menouf (8.12%) and El-Shohadaa (8.02%). For obesity, it was more prevalent in Quesina (17.4%) and Sers Ellian (15.7%) and less prevalent in EL-Bagour (7.2%). **Conclusion:** Hypertension and obesity were more prevalent than diabetes in Menoufia governorate. Male gender was a risk factor for HT while female gender was a risk factor for DM and obesity. Age >40 y was a risk factor for all diseases being studied.

Key words: Diabetes, Family, hypertension, mapping obesity, Menoufia.

Introduction:

Hypertension (HT) and type 2 Diabetes mellitus (DM) are among the most common non-communicable chronic diseases in developed and developing countries around the world.

⁽¹⁾They are the main preventable risk

factors for coronary heart disease, stroke, end-stage renal failure, disability and increased health-care costs. Although DM and HT are not among the top leading causes of death like in the case of cancer and stroke, these two diseases draw attention due to their consistently

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growing trends.⁽²⁾ Hypertension is a multifactorial disease, and it is related to heredity, diet, environment pollution, and other factors.⁽³⁾

Twenty nine percent of the world's adult population are projected to have hypertension by the year 2025; therefore, prevention and management of hypertension have become a public health priority.⁽⁴⁾

Diabetes is a fast-growing health problem in Egypt with a significant impact on morbidity, mortality, and health care resources. Currently, the prevalence of type 2 diabetes in Egypt is around 15.6% of all adults aged 20 to 79 years, which puts Egypt at the ninth rank in the world for the number of DM patients according to International Diabetes Federation (IDF).

The prevalence of DM in Egypt has almost tripled over the last 2 decades. This sharp rise could be attributed to either an increased pattern of traditional risk factors such as obesity and physical inactivity and change in eating pattern, in addition to increased exposure to environmental risk factors like pesticides and increased prevalence of chronic hepatitis C.⁽⁵⁾ The American Heart

Association considers diabetes as one of the six major controllable risk factors for cardiovascular disease.⁽⁶⁾

Epidemiological and clinical studies have shown that these diseases often cluster in individuals and in families.⁽⁷⁾ Several studies conducted in different ethnic groups showed a close association between HT and DM, where the prevalence of HT is significantly higher in the patients with non-insulin dependent DM.⁽⁸⁾ Obesity is associated with a greater number of metabolic complications including type 2 diabetes and hypertension. Insulin may elevate blood pressure by affecting renal sodium retention. Several epidemiologic studies showed that excess weight substantially increased the risk for hypertension.

Obesity is dramatically growing in Eastern Mediterranean Region including Egypt. It is a major risk factor for the development of type 2 diabetes. Underlying and possible inherited insulin resistance is compounded by the fact that obesity worsens insulin sensitivity.⁽⁹⁾ In low-income and middle-income countries (including Egypt), the estimated age-standardized death rates in the year 2005 for chronic diseases in 54% higher for

men and 86% higher for women than men and women in high-income countries.

An estimated US \$84 billion of economic production will be lost from chronic diseases (heart disease, stroke, and diabetes alone) if no actions are taken to reduce the risk of these diseases ⁽¹⁰⁾. Because of the growing health and economic burden of chronic diseases in Egypt, and lack of information about the epidemiology of hypertension, DM, and obesity distribution, in an entire Egyptian governorate, the aim of this study was to estimate the prevalence and describe the epidemiological mapping of hypertension, diabetes mellitus and obesity among Menoufia medical students' family members.

Methods:

A cross-sectional study was carried out on Menoufia medical students and their families during the academic year 2018-2019. Menoufia faculty of medicine is located at Menoufia governorate in Egypt and accommodates nearly 3800 students from all over the governorate. The study system is distributed over 6 years. In our study, we invited all grades starting from second to sixth grade as a cluster sample (not

including the first junior grade being unfamiliar with studying system and research objectives). A pre-designed self-administered questionnaire addressing chronic diseases was distributed among the included students. The questionnaire included data about participants' demographic profile (age, sex and residence) and questions about complaining of diabetes mellitus, hypertension and obesity. A pilot study was conducted on 350 students (~10%) to test the students' response, validity of the questionnaire, clarity of the questions by students and their families, and to evaluate the efficacy of the questionnaire to be adjusted if need be. After exclusion of 550 students due to either incomplete questionnaire or refusal to participate, a total of 2442 questionnaires were valid to be included in the study with a response rate of 82%. At last, the total number of the students' family members was 13,782 individuals with a range of 3-7 members per family. Those students are already distributed in the 10 districts of Menoufia Governorate. For affirming obesity, participants were asked to measure height and weight of themselves bare footed and without heavy clothes by an electronic

scale (model no. HJKH-02, country: China, brand name: Sincoly). Weight was measured to the nearest 0.5 kg. Height was measured to the nearest 0.1 m. BMI (body mass index) was then calculated by dividing weight in kg by the square height in meters, body mass index above 30 was considered obese.

Ethical Considerations: Approval from the research and ethics committee of Menoufia faculty of medicine and an informed student's family assent were obtained after explanation of all aspects of the study and the right to withdraw at any time. The main outcome measures were the proportions (prevalence rates) of DM, HT and obesity among the families of Menoufia medical students.

Statistical analysis: Data were collected, tabulated and statistically analyzed by an IBM compatible personal computer with SPSS statistical package version 23 (SPSS Inc. Released 2015. IBM SPSS statistics for windows, version 23.0, Armonk, NY: IBM Corp.). Chi-square test (χ^2) was used to study the correlation between qualitative variables. Two-sided *p*-value of <0.05 was set to be statistically significant.

Results:

Among the entire studied group constituting 13,782 individuals, the prevalence of hypertension, diabetes mellitus and obesity was reported to be 12.3%, 7.05% and 11.7% respectively. Districts wise, Elbagour, Tala and Shebin Elkom were ranked as the top 3 districts in Monoufia governorate regarding hypertension prevalence, which was 14.65%, 14.34% and 14.05% respectively, followed by Berket Elsaba (12.97%), Ashmon (12.75%), Menouf (11.90%) and Elshohada (10.99%), lastly, Quesina (9.91%), Elsadat (6.21%) and Sers Ellian (5.57%). Diabetes mellitus was most prevalent in Ashmon (8.97%), Berket Elsaba (8.10%), Menouf (8.12%) and Elshohadaa (8.02%), followed by Elbagour (7.01%) and Tala (7.57%) and lastly Shebin Elkom (5.36%), Elsadat (7.91%) and Sers Ellian (3.6%). For obesity, it was more prevalent in Quesina (17.4%), Sers Ellian (15.7%) and less prevalent in EL-Bagour (7.2%). Elbagour district showed concentration of high levels of both hypertension and diabetes while Quesna district showed high levels of the 3 of hypertension, diabetes and obesity (**Table 1, Fig. 1- 3**)

The studied group showed significantly higher prevalence of hypertensive cases among males, older than 40 years and those living in urban areas ($p < 0.001$) (Table 2). Diabetes mellitus had significantly higher prevalence among females older than 40 years ($P < 0.001$) without association with the residential area either rural or urban ($P = 0.126$) (Tables 2). Obesity had significantly higher prevalence among females, older than 40 years and those of urban residence ($P < 0.001$). (Tables 2)

Discussion:

Egypt is the most populated country in the Arab world. The total Egyptian population reached 100 million in February 2020 according the CAPMAS.⁽¹¹⁾ As a part of the Mediterranean area, Egypt has an increasing burden of non-communicable diseases (NCDs) which is one of the major developmental challenges in the 21st century. NCDs are responsible for more than 57% (2.2 millions) of all deaths in the region. Unless serious actions are taken, this number may reach 2.4 million deaths by the year 2025.⁽¹²⁾

The prevalence of hypertension was found to be 12.3% in this survey. A

higher prevalence was observed among males and urban resident population. These results conform to the Egypt health issue survey (EHIS) 2015, which reported that around 1 in 6 women and men aged 15-59 were diagnosed as hypertensive. Age was directly correlated with the proportion who was suffering hypertension; more than 50% of women and more than 2 in 5 men in aged 55-59 were hypertensive, and 11% of women and 10% of men in same age group had a moderately or severely elevated blood pressure. Many Egyptians did not know that they have hypertension and among them, 73% of men and 47% of women were not ever told previously that their blood pressure was elevated. Hypertension was higher in urban population with 17.2% compared to rural population with 16.4%.⁽¹³⁾

Higher prevalence of hypertension (38.2%) was observed by Gabal et al.⁽¹⁴⁾ in a village in Menoufia governorate, and another population survey conducted by Gadalla et al.⁽¹⁵⁾ reported a prevalence of 31.2% in a slum area in Cairo, and revealed increased hypertension prevalence with increasing age. This study is more in line with the results of

Egypt health issue survey's data and clearly showed lower rates than Gabal and colleagues.^(14, 15) This may be due to different sample characteristic that was much smaller than ours.

About 422 million adults in the whole world were suffering from diabetes in 2014, compared to 108 million in 1980s. Its global prevalence has nearly doubled since 1980 from 4.7% to 8.5% in 2014. This was associated with the increased prevalence of risk factors such as overweight and obesity. Diabetes prevalence was also higher in low- and middle income countries than high-income countries.⁽¹⁶⁾ In the current work, the overall prevalence of diabetes was 7.05%. It was more prevalent in female 7.8% versus 6.21% among males. Herman et al.,⁽¹⁷⁾ performed a cross-sectional population based survey on 6052 adults (≥ 20 years) in Cairo and its rural surroundings and found the overall prevalence of diabetes was 9.35%. In rural areas, 4.9% had diabetes, while 13.5% of the lower SES urban population had diabetes and 20.0% of the higher SES had diabetes.

In the year 2012, the prevalence of diabetes was 17.2% among adult

Egyptian population aged 20-79 years as reported by MOHP and FETP population bases survey. The WHO diabetes country profile in 2016 showed higher overall prevalence of diabetes (16.2%) in the whole population, however it agreed to our study in being more prevalent in females (18.2%) than males (14.2%).⁽¹⁸⁾ These findings interestingly indicate a significant lower prevalence of DM in Menoufia governorate for more in deep research for its underlying factors.

Regarding obesity, in this survey, the prevalence was found to be 11.7%. This is higher than a prevalence of 6.5 % reported by national nutritional institute according to a survey conducted in 2007.⁽¹⁹⁾ While another survey that was conducted by Health & Pharmaceuticals, State of Health and was performed throughout the period from 2007 to 2016 revealed very different findings. It documented increasing obesity prevalence throughout the studied years from 24.6% to 31.1%.⁽²⁰⁾

This increasing prevalence can be explained as modernization pushes towards sedentary lifestyle, the increasing rate of obesity represents one of its major outcomes as it has led to

energy imbalance due to lack of physical activities.⁽²¹⁾ Egypt is considered an over-urbanized country as many of its population have moved from traditional farming life to the urban modernized life.⁽²²⁾

The prevalence of obesity among females in the present study was 14.19% and among males was 10.43%. These findings were much lower than a study conducted in 2005 and reported that obesity was 21.8% in males and 39% in females.⁽²³⁾ Another one conducted in 2014 found that obesity in males was 21.4%, while in females it was 48.5%.⁽²⁴⁾ These controversies in findings in different studies need a regular national estimate for obesity as a modifiable risk factor for upcoming non-communicable disease epidemics in Egypt.

This study showed increased prevalence of diabetes, hypertension and obesity in the middle age adults and this is in agreement with the fact that many more middle-aged people are being diagnosed with diabetes, with the rate among the 40-60 age groups doubling in the past 20 years. Obese adults are five times more likely to develop type 2

diabetes, compared to those who have healthy weight ranges.

The present study showed prevalence of obesity with age, and among females, this is in agreement with a study conducted in 2002 and highlighted the significant increase in the prevalence of obesity and overweight with age in both Saudi males and females.⁽²⁵⁾ From our results it seemed that there was some sort of association between hypertension, diabetes and obesity in relation to age as the three parameters are more prevalent among adults aged >40 years. Regarding gender there is association between diabetes and obesity among females which is in agreement with a study conducted with Wang et al.⁽²⁶⁾

Conclusion: Hypertension, diabetes and obesity were prevalent in Menoufia governorate regarding male and female gender, >40 years old age and in urban sector. There is need to extensive awareness programs for the general public, highlighting the causes, complications and how to provide control of diabetes, hypertension and obesity.

Study limitations: the relatively low response rate by the invited medical

students and the large number of incomplete questionnaires.

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Table (1): Prevalence of hypertension, diabetes and obesity in different districts of Menoufia governorate

Menoufia Governorate Districts(no.=10)	Total studied population (No.=13782)	Hypertension		Diabetes Mellitus		Obesity	
		No	%	No	%	No	%
▪ Shebin Elkom	2762 (20.0)	388	14.05	148	5.36	353	12.8
▪ El bagour	1470 (10.7)	214	14.56	103	7.01	106	7.20
▪ Tala	1624 (11.8)	233	14.34	123	7.57	208	12.8
▪ Ashmon	1450 (10.5)	185	12.75	130	8.97	162	11.20
▪ Berket Elsaba	1395 (10.1)	181	12.97	113	8.10	130	9.30
▪ Quesina	1442 (10.5)	143	9.91	102	7.07	251	17.4
▪ Menouf	997 (7.2)	119	11.90	81	8.12	118	11.8
▪ Sers Ellian	305 (2.2)	17	5.57	11	3.60	48	15.7
▪ Al shohada	1483 (10.8)	163	10.99	119	8.02	147	9.90
▪ El sadat	854 (6.2)	53	6.21	42	4.91	87	10.20
Total	13782	1696	12.30	972	7.05	1610	11.70

Table (2): Risk factors associated with hypertension, diabetes and obesity among the studied group:

	Hypertension				χ^2	P value	OR CI 95%
	Present (n=1696)		Absent (n=12086)				
	No	%	No	%			
Age (years)							
▪ ≤40	294	4.09	6373	95.91	746.13	<0.001*	5.27(4.63-6.01)
▪ >40	1402	19.70	5713	80.30			
Sex							
▪ Male	1003	14.69	5824	97.31	71.53	<0.001*	1.56(1.40-1.73)
▪ Female	693	9.96	6262	90.04			
Residence							
▪ Rural	837	11.34	6545	88.66	13.79	<0.001*	1.21(1.10-1.34)
▪ Urban	859	13.42	5541	86.58			
	Diabetes mellitus						
	Present (n=972)		Absent (n=12810)				
Age (years)							
▪ ≤40	109	1.34	7990	98.66	975.81	<0.001	13.12(10.72-16.07)
▪ >40	863	15.18	4820	84.82			
Sex							
▪ Male	411	6.21	6205	93.79	13.71	<0.001	1.28(1.12-1.46)
▪ Female	561	7.83	6605	92.17			
Residence							
▪ Rural	499	7.39	6251	92.61	2.33	0.126	0.90(0.79-1.03)
▪ Urban	473	6.72	6559	93.28			
	Obesity						
	Present (n=1610)		Absent (n=12172)				
Age (years)							
▪ ≤40	412	5.40	7218	94.60	653.8	<0.001*	4.23(3.76-4.76)
▪ >40	1198	19.5	4954	80.5			
Sex							
▪ Male	683	10.43	6561	90.57	165.57	<0.001*	1.59(1.43-1.76)
▪ Female	927	14.19	5605	85.81			
Residence							
▪ Rural	655	10.62	5514	89.38	12.26	<0.001*	1.21(1.09-1.34)
▪ Urban	955	12.54	6658	87.46			

*Statistically Significant

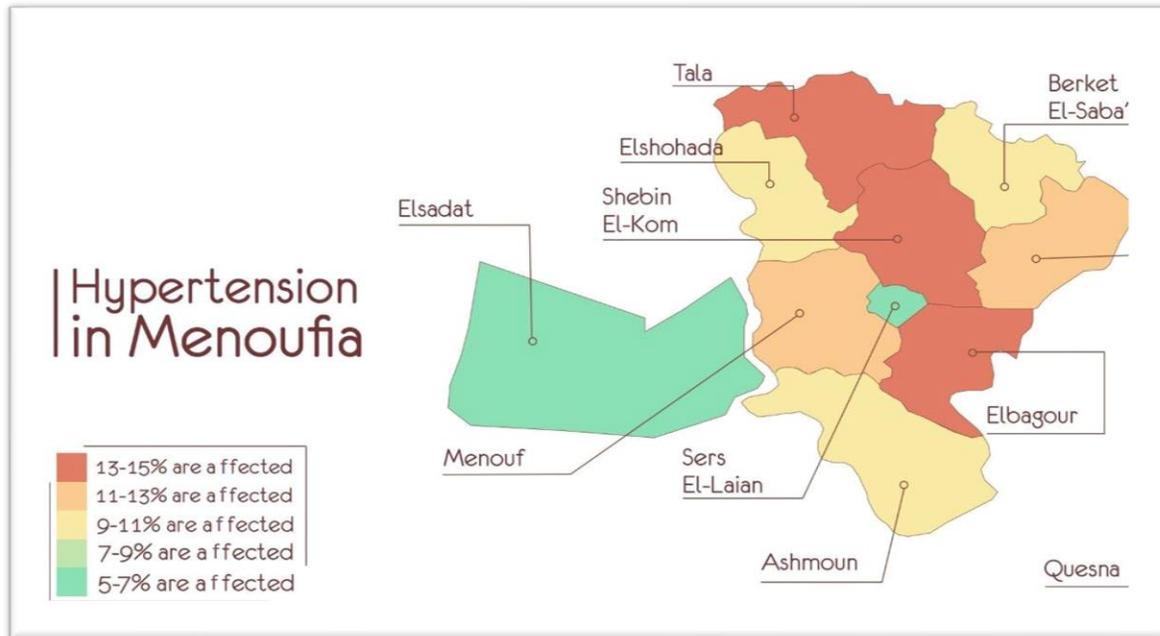


Fig (1): Mapping of hypertension in Menoufia governorate

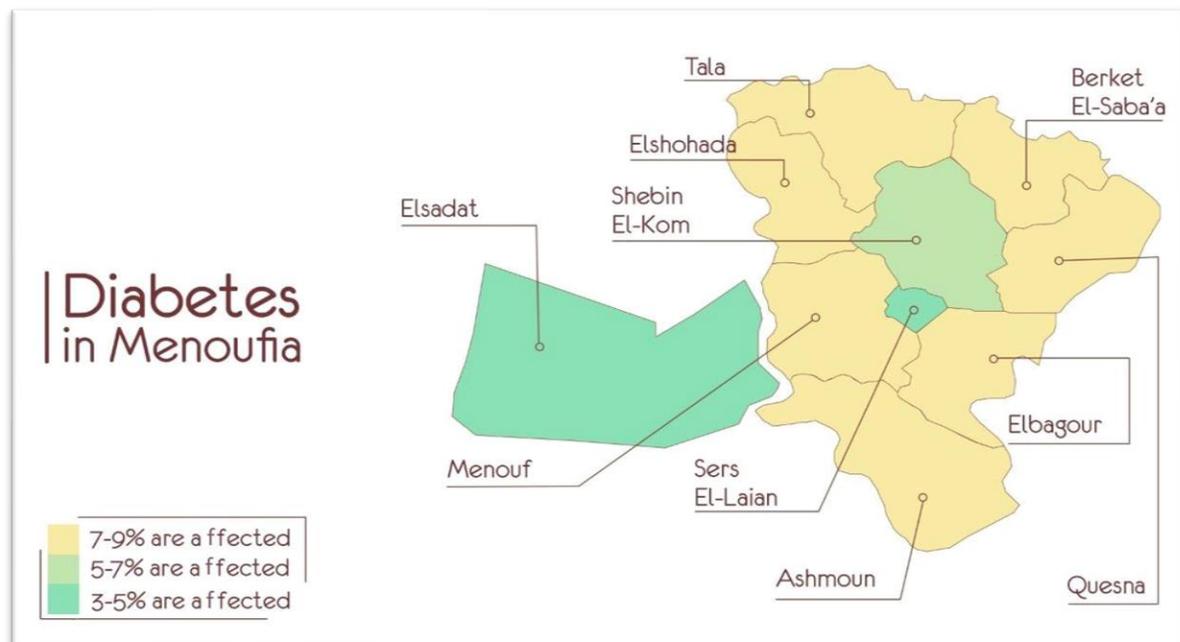


Fig (2): Mapping of diabetes mellitus in Menoufia governorate

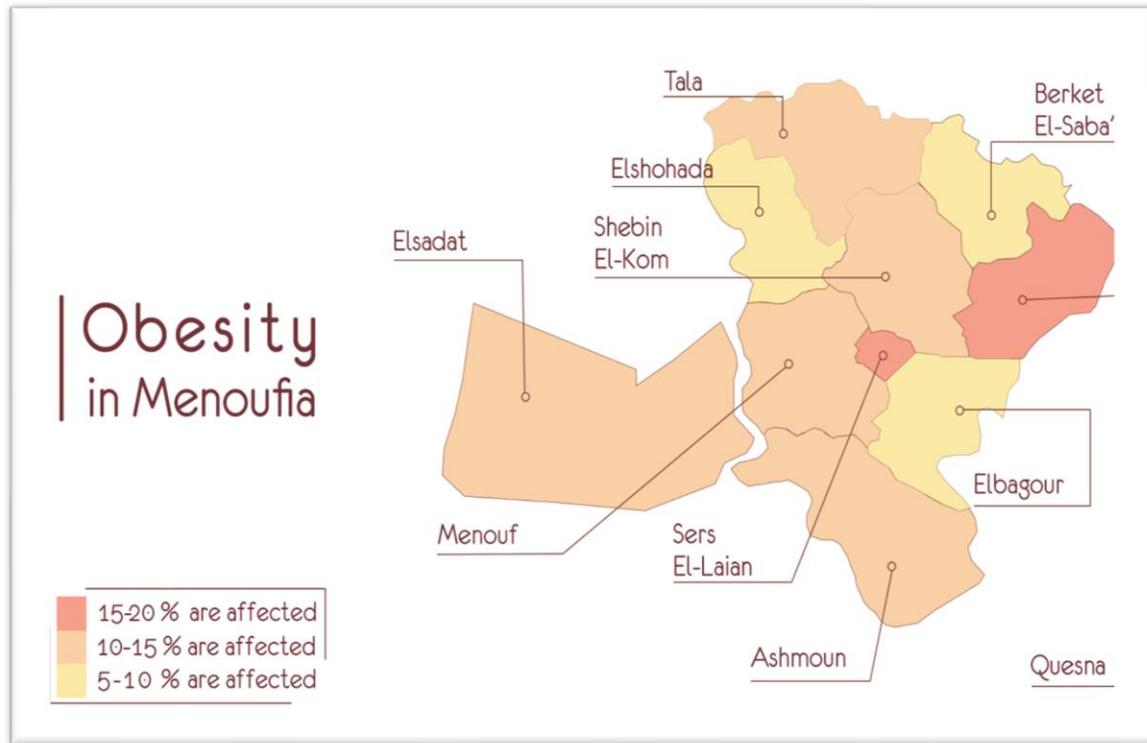


Fig (3): Mapping of obesity in Menoufia governorate

الملخص العربي

الخريطة الوبائية لارتفاع ضغط الدم واليوال السكري والسمنة لدى أفراد أسر طلاب كلية الطب -
محافظة المنوفية-مصر

هالة مروان - رضا عبداللطيف الغمريني - زينب عبدالعزيز قاسم - شيماء شريف سليمان

الخلفية العلمية:أوضحت الدراسات السابقة أن ارتفاع ضغط الدم (HT) داء السكري من النوع الثاني وأيضا السمنة تعد من الأمراض المزمنة غير المعدية وهي الأكثر شيوعا في كل من البلدان النامية وكذلك المتقدمة وتشكل عبء اقتصاديا هائلا على المريض والمجتمع. **الأهداف:** تقدير معدل الانتشار الوبائي لارتفاع ضغط الدم ومرض السكري والسمنة بين أفراد أسر طلاب كلية الطب بالمنوفية. **منهجيته البحث:** دراسة مقطعية شملت 13782 من أفراد أسر مجموعة من طلاب كلية الطب ، جامعة المنوفية. امتدت الدراسة من 1 أكتوبر 2018 إلى 31 يناير 2019 وتم إخضاع المشاركين لاستبيان مُصمم مسبقاً، يتضمن البيانات الديموغرافية (العمر والجنس ومكان الإقامة) وأسئلة حول وجود تاريخ مرضي للإصابة بارتفاع ضغط الدم ومرض السكري والسمنة بين أفراد الأسرة للطلاب المشاركين البالغين (فوق سن 18 سنة). **النتائج:** كانت معدلات انتشار ارتفاع ضغط الدم والسكري والسمنة 12,3 % ، 7,05 % و 11,7 % بالترتيب. كانت الإصابة بارتفاع ضغط الدم أكثر انتشاراً بين الذكور، الذين تزيد أعمارهم عن 40 عاماً والذين يعيشون في المناطق الحضرية، في حين كان مرض السكري أكثر انتشاراً بين الإناث، والذين تجاوزت أعمارهم 40 عاماً (P value <0.001) دون ارتباط ذا دلالة احصائية مع مكان الإقامة. احتلت مراكز (الباجور وتلا وشبين الكوم) المراكز الثلاثة الأولى في محافظة المنوفية ومثلت نسبة المرضى الذين يعانون من ارتفاع ضغط الدم كالتالي 14,65% و 14,34% و 14,05% على التوالي ، وكان مرض السكري أكثر انتشاراً في أشمون (8,97) ، وبركة السبع (8,10) ، ومنوف (8,12) الشهداء (8,02)%. بالنسبة للسمنة ، كانت أكثر انتشاراً في قويسنا (17,4) % ، وسرس الليان (15,7) % وأقل انتشاراً في الباجور 7,2% . **الاستنتاجات:** ارتفاع ضغط الدم والسكري والسمنة هي أمراض منتشرة في محافظة المنوفية حيث لها ارتباطات دالة إحصائية بنوع الجنس من الذكور والإناث ، والذين تزيد أعمارهم عن 40 عاماً وفي القطاع الحضري.