

Prevalence and Patterns of Chronic Diseases Among Adult Smokers in the City of Zawia, Libya: A Cross-Sectional Study

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Abstract:

➤ *Background:*

Smoking remains a major global public health concern and a key contributor to chronic disease burden. Despite its known health consequences, limited data are available on the prevalence and patterns of chronic diseases among smokers in Libya.

➤ *Aim:*

This study aimed to determine the prevalence and distribution of chronic diseases among adult smokers in the city of Zawia, Libya, and to explore their association with demographic and behavioural factors.

➤ *Methods:*

A cross-sectional study was conducted among 100 adult smokers in Zawia using a structured questionnaire that assessed demographic characteristics, smoking behaviours, and the presence of chronic diseases including diabetes, hypertension, asthma, heart disease, and arthritis. Data were analysed using descriptive and correlation statistics to assess relationships between variables.

➤ *Results:*

The mean age of participants was 41.2 ± 10.4 years. The majority (41%) were aged between 40–50 years, 89% were government employees, and 58% held secondary-level education. The average smoking duration was 19 years, with a mean of 21.6 cigarettes smoked per day.

The prevalence of chronic diseases among smokers was as follows: diabetes (17%), hypertension (15%), asthma (12%), heart disease (11%), and arthritis (14%). Despite these observed rates, statistical analyses revealed no significant correlations between age, age of smoking initiation, or number of cigarettes smoked per day and the occurrence of chronic diseases ($p > 0.05$).

➤ *Conclusion:*

The findings highlight a considerable burden of chronic diseases among adult smokers in Zawia. Although no significant associations were found between smoking patterns and disease occurrence, the high prevalence of these conditions emphasizes the urgent need for targeted health awareness, early screening, and smoking cessation programs to reduce chronic disease risks in Libyan communities.

Keywords: Smoking, Chronic Diseases, Hypertension, Diabetes, Heart Disease, Respiratory Allergy, Arthritis, Zawia, Libya.

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I. INTRODUCTION

Tobacco use has been a global public health concern since its introduction to Europe from the Americas in the late fifteenth century, initially for medicinal purposes (1). Over time, smoking spread rapidly throughout the world and became one of the most widespread habits affecting adults, adolescents, and even children (2).

Tobacco smoke contains harmful substances such as nicotine, tar, and toxic gases, which are associated with the development of numerous diseases including cardiovascular diseases, hypertension, diabetes, chronic obstructive pulmonary disease (COPD), respiratory allergies, and asthma (3–13). Cigarette smoking is the primary cause of COPD, and cessation remains the most effective method to halt disease progression (4). Globally, tobacco use is the second leading cause of death, responsible for around 5 million deaths annually, with more than 1.1 billion smokers—70% of whom live in low- and middle-income countries (5). The global economic burden of smoking exceeds USD 1.4 trillion annually (6).

In the Arab world, smoking prevalence varies widely, ranging from 72% in Saudi Arabia to 26% in Lebanon, with rates of 33.1% in Yemen, 46.7% in Egypt, 46% in Kuwait, and 28.3% in Libya (6). Despite tobacco control policies in Libya—including bans on smoking in public places, advertising restrictions, and prohibitions on sales to minors—tobacco use remains a major public health issue (15,16).

However, data on the prevalence of chronic diseases among smokers in Libya, particularly in Zawia, are scarce. This study aims to fill this knowledge gap by determining the prevalence and patterns of chronic diseases among adult smokers in the city of Zawia, Libya.

➤ Importance

The lack of empirical data on chronic diseases among smokers in Zawia underscores the importance of this study. By quantifying the prevalence and distribution of chronic diseases within this population, the research provides valuable insights that can inform evidence-based health policies, enhance awareness, and support national efforts to reduce the health burden associated with smoking in Libya.

➤ Objectives

- To determine the prevalence and distribution of chronic diseases—including hypertension, diabetes mellitus, cardiovascular diseases, respiratory allergies, and arthritis—among adult smokers aged 20 years and above in Zawia, Libya.

- To identify possible patterns and correlations between smoking habits and the occurrence of chronic diseases among smokers.

II. METHODS

➤ Study Design and Sampling:

This descriptive cross-sectional study employed a structured survey approach. The target population included adult male smokers aged 20 years and above residing in Zawia, Libya. The sample size ($n = 100$) was determined using Thompson's formula (16), with a margin of error of 0.05, a confidence level of 95% ($Z = 1.96$), and an expected population proportion of 0.5. The estimated total population of male smokers was approximately 41,625. A simple random sampling method was used to select participants.

➤ Data Collection Instruments:

A self-administered questionnaire was developed, consisting of three main sections:

- Demographic information: age, educational level, occupation, monthly income, and blood type.
- Smoking habits: age at smoking initiation, duration of smoking, number of cigarettes smoked per day, and willingness to quit.
- Chronic diseases: participants were asked about hypertension, diabetes, heart disease, asthma, arthritis, and their perception of smoking-related harm.

The survey was conducted over six months, from June 2024 to December 2024. The questionnaire was pilot-tested for validity and reliability, and Cronbach's alpha was calculated to assess internal consistency.

➤ Data Analysis:

Data were analysed using IBM SPSS version 25. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to describe the sample characteristics and disease prevalence. Correlation analyses were applied to explore relationships between smoking habits and chronic diseases. Statistical significance was set at $p < 0.05$.

➤ Ethical Considerations:

The study adhered to ethical standards for human research. Participants were informed about the study's objectives, and written informed consent was obtained. Participation was voluntary, and data confidentiality was strictly maintained throughout the study process.

III. RESULTS

A. Results of Axis 1: Demographic Information

Table 1 Shows the Results of Demographic Information

		Ag	Ag Group	Education level	Job	Monthly salary	Salary category?	Blood Group
N	Valid	100	100	100	100	100	100	100
	Missing	0	0	0	0	0	0	0
Mean		41.1800	2.6200	1.5000	1.1100	1990.0000	1.9900	2.7900
Std. Deviation		10.41112	1.07101	.64354	.31447	797.66072	.79766	1.35807
Range		52.00	4.00	2.00	1.00	3000.00	3.00	3.00
Minimum		20.00	1.00	1.00	1.00	1000.00	1.00	1.00
Maximum		72.00	5.00	3.00	2.00	4000.00	4.00	4.00

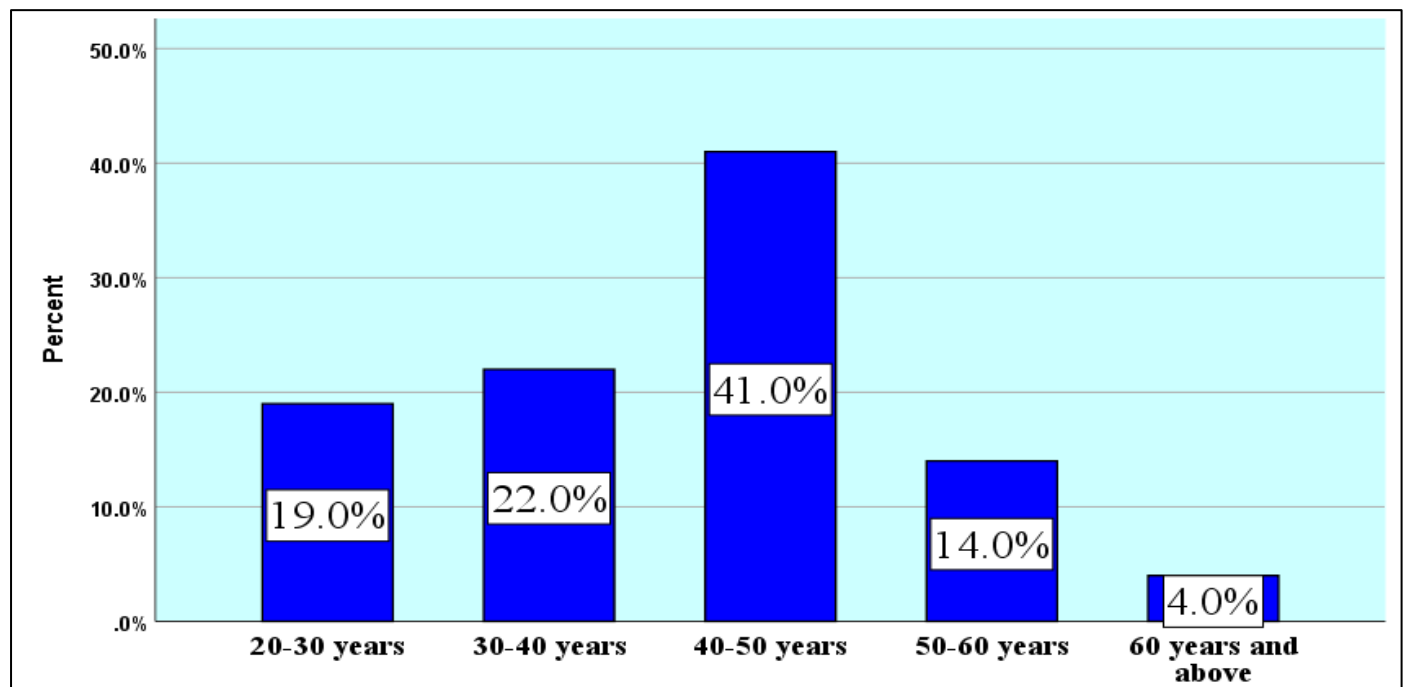


Fig 1 Shows the Proportions of Age Groups.

The age range spanned from 20 to 72 years, with a mean age of 41.18 years and a standard deviation of 10.41 years. The age distribution was as follows: 19% of participants were between 20-30 years old, 22% were between 30-40 years old, 41% were between 40-50 years old, 14% were between 50-60 years old, and 4% were 60 years old or more.

The results show that the relationship between age and chronic diseases in this study is weak and non-significant, with correlations of -0.025 ($p = 0.807$) for heart disease, -0.072 ($p = 0.478$) for diabetes, 0.072 ($p = 0.478$) for chest sensitivity and shortness of breath, -0.093 ($p = 0.359$) for hypertension, and -0.004 ($p = 0.968$) for arthritis. Overall, there are no statistically significant relationships between age and any of the chronic diseases mentioned in this study.

The results show that the relationship between age when starting smoking and chronic diseases is weak and non-significant, with correlations of -0.050 ($p = 0.618$) for heart disease, 0.129 ($p = 0.202$) for diabetes, -0.054 ($p = 0.593$) for chest sensitivity and shortness of breath, -0.092 ($p = 0.363$)

for hypertension, and 0.183 ($p = 0.068$) for arthritis, which approaches significance.

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The educational level of participants ranged between secondary and university, with a mean of 2.62 and a standard deviation of 1.07. The distribution of educational level was as follows: 58% of participants had a secondary school certificate, 34% had a bachelor's degree, and 8% had a master's or doctoral degree.

The results revealed that the average salary stands at \$248.75, with a substantial variation among salaries, as indicated by a standard deviation of \$99.71. Salaries ranged from a minimum of \$125 to a maximum of \$500. This

disparity suggests notable income distribution differences, potentially affecting individuals' living standards and economic stability. The distribution of monthly income was as follows: 28% of participants earned \$125, 49% earned \$250, 19% earned \$375, and 4% earned \$500.

The occupation was distributed as follows: 89% of participants worked in government jobs, and 11% worked in freelance jobs.

The distribution of blood groups among participants was as follows: 31% had blood group A, 11% had blood group B, 6% had blood group AB, and 52% had blood group O. The results suggest a weak association between blood type and heart disease (-0.197) and diabetes (-0.189). However, no statistically significant correlation was found between blood type and other chronic diseases.

B. Results of Axis 2: Habits and Behaviours of Smokers.

Table 2 Shows the Results of Habits and Behaviours of Smokers

Statistics						
		Age at time of learning to smoke	Duration of smoking.	Number of cigarettes smoked per day.	Have you considered quitting smoking?	Price per pack in US dollars
N	Valid	100	100	100	100	100
	Missing	0	0	0	0	0
Mean		21.0900	19.0000	21.6000	1.2200	.6077
Std. Deviation		5.09921	10.22870	12.40886	.41633	.37013
Range		30.00	43.00	35.00	1.00	1.53
Minimum		10.00	2.00	5.00	1.00	.26
Maximum		40.00	45.00	40.00	2.00	1.79

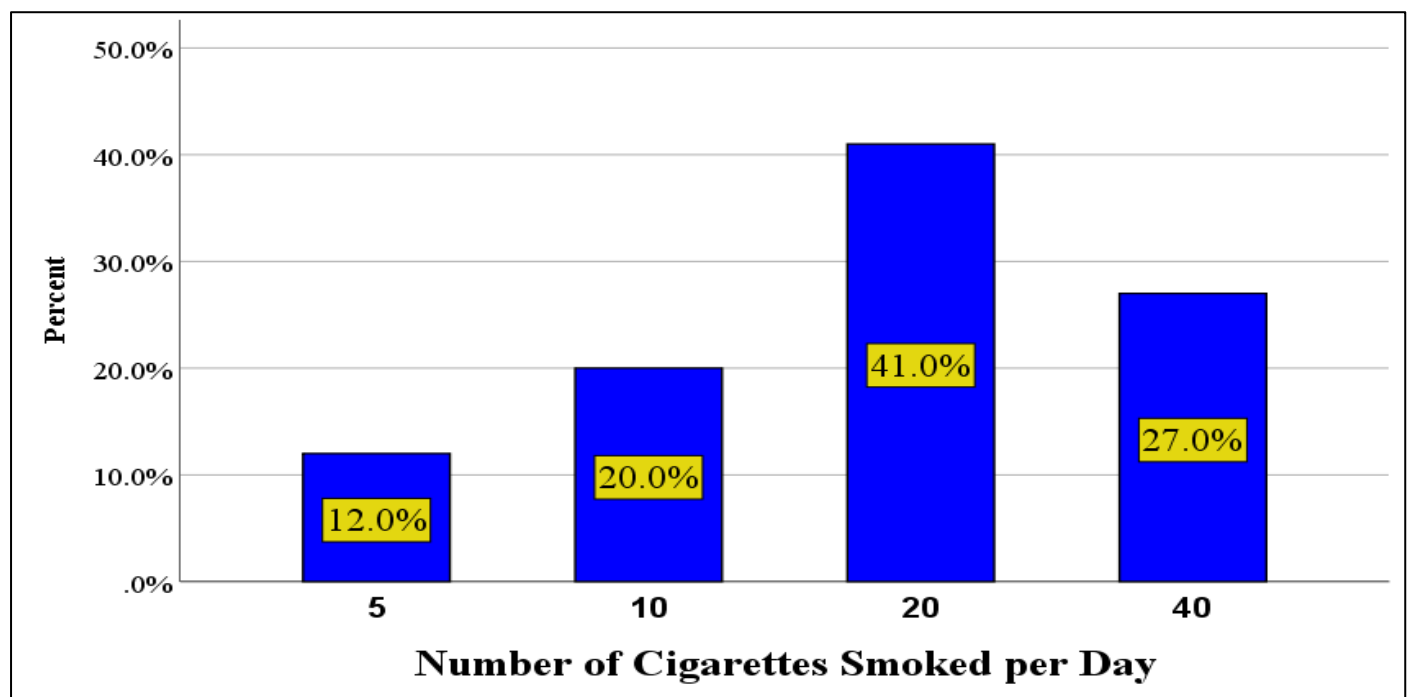


Fig 2 Shows the Percentage of Smokers and the Number of Cigarettes Smoked Per Day.

➤ Age at Smoking Initiation

The age at smoking initiation ranged from 10 to 40 years, with a mean of 21.09 years and a standard deviation of 5.10. The distribution of age at smoking initiation was as follows: 12% of participants started smoking between 10-15 years, 47% started between 15-20 years, and 24% started between 20-25 years, and 15% started between 25-30 years, and 2% started between 35-40 years.

➤ Duration of Smoking

The duration of smoking ranged from 2 to 45 years, with a mean of 19 years and a standard deviation of 10.22870.

Number of Cigarettes Smoked per Day

The number of cigarettes smoked per day ranged from 5 to 40 cigarettes, with a mean of 21.6 cigarettes and a standard deviation of 12.40886.

12% of participants smoked 5 cigarettes per day, 20% smoked 10 cigarettes per day, 41% smoked 20 cigarettes per day, and 27% smoked 40 cigarettes per day.

➤ Consideration of Quitting Smoking

The results showed that 78% of participants had considered quitting smoking, while 22% had not.

➤ Price per Pack in US Dollars

The study found that the average price of a pack of cigarettes purchased by smokers is \$0.6077, with a standard deviation of \$0.37013. The prices ranged from a minimum of \$0.26 to a maximum of \$1.79. Notably, 57% of the sample

purchased cigarette packs at prices between \$0.2 and \$0.6, while 27% bought at prices between \$0.6 and \$1.0, 14% between \$1.0 and \$1.6, and only 2% between \$1.6 and \$1.8.

C. Results of Axis 3: Smokers and Chronic Diseases.

Table 3 Shows the Results of Smokers and Chronic Diseases

		Statistics					
		Do you think smoking is ?harmful to your health	Do you have ?diabetes	Do you suffer ?from asthma	Do you have high ?blood pressure	Do you have ?heart disease	Do you suffer ?from arthritis
N	Valid	100	100	100	100	100	100
	Missing	0	0	0	0	0	0
Mean		1.0000	1.8300	1.8800	1.8500	1.8900	1.8600
Std. Deviation		.00000	.37753	.32660	.35887	.31447	.34874
Range		.00	1.00	1.00	1.00	1.00	1.00
Minimum		1.00	1.00	1.00	1.00	1.00	1.00
Maximum		1.00	2.00	2.00	2.00	2.00	2.00

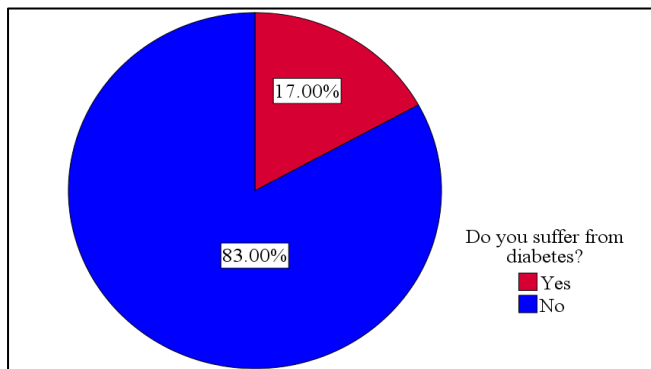


Fig 3 Shows the Percentage of Diabetes in the Sample.

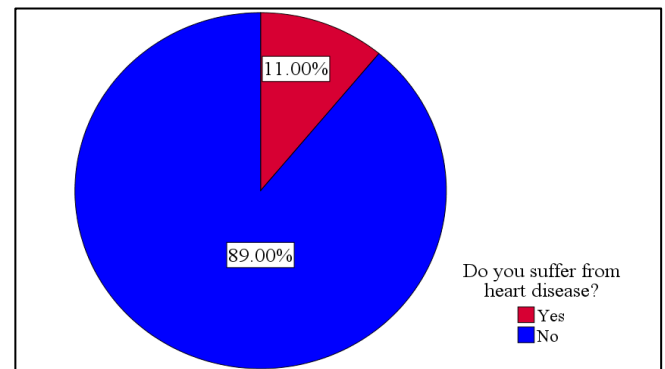


Fig 6 Shows the Percentage of Heart Disease in the Sample.

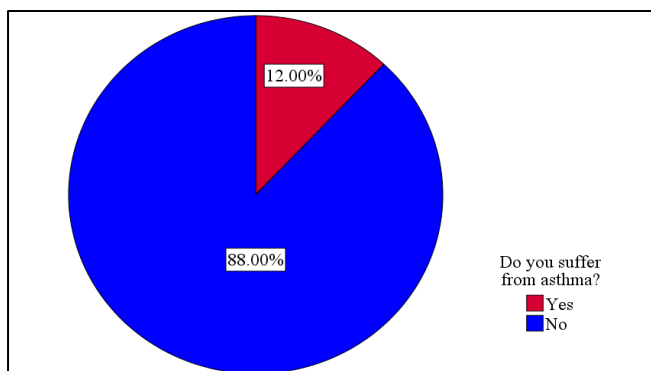


Fig 4 Shows the Percentage of Asthma in the Sample.

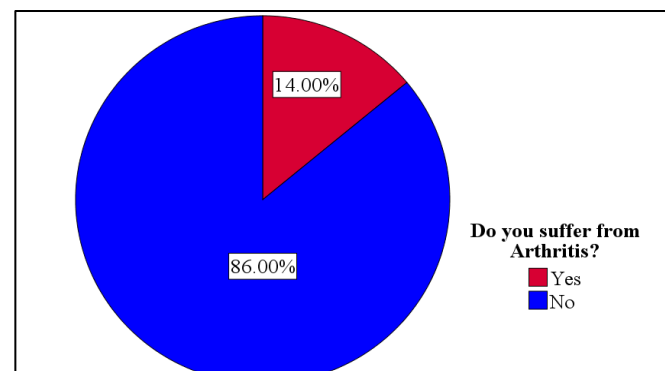


Fig 7 Shows the Percentage of Arthritis in the Sample.

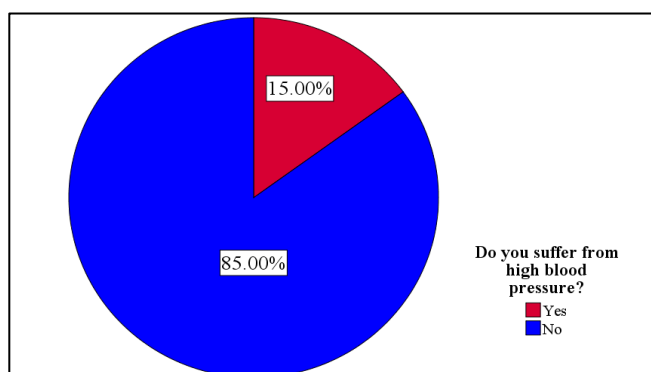


Fig 5 Shows the Percentage of Hypertension in the Sample.

➤ Awareness of Smoking-Related Health Risks

The results showed that all participants (100%) were aware of the health risks associated with smoking. This indicates a high level of awareness about the dangers of smoking among individuals.

➤ Prevalence of Diabetes

The prevalence of diabetes among participants was 17%. This percentage suggests that smoking may contribute to an increased risk of developing type 2 diabetes. The high prevalence of diabetes among smokers is consistent with previous research that has shown a strong link between smoking and diabetes¹⁷.

The results showed that 12% of participants suffered from asthma. This percentage indicates that smoking may have a negative impact on respiratory health. The prevalence of asthma among smokers is consistent with previous research that has shown that smoking can exacerbate respiratory symptoms and increase the risk of asthma¹⁸.

➤ *Prevalence of Hypertension*

The prevalence of hypertension among participants was 15%. This percentage suggests that smoking may contribute to an increased risk of cardiovascular disease. The high prevalence of hypertension among smokers is consistent with previous research that has shown a strong link between smoking and cardiovascular disease¹⁹.

➤ *Prevalence of Heart Disease*

The results showed that 11% of participants suffered from heart disease. This percentage indicates that smoking is a significant risk factor for cardiovascular health. The prevalence of heart disease among smokers is consistent with previous research that has shown that smoking can increase the risk of heart disease¹⁸.

➤ *Prevalence of Arthritis*

The prevalence of arthritis among participants was 14%. This percentage suggests that smoking may have a negative impact on overall health. The prevalence of arthritis among smokers is consistent with previous research that has shown that smoking can increase the risk of arthritis²⁰.

The current study's results showed no statistically significant relationship between age and any of the mentioned chronic diseases, with correlation values as follows: diabetes ($r = -0.072$, $p = 0.478$), hypertension ($r = -0.093$, $p = 0.359$), heart diseases ($r = -0.025$, $p = 0.807$), and arthritis ($r = -0.004$, $p = 0.968$).

The study's results showed no statistically significant relationship between age at smoking initiation and any of the mentioned chronic diseases, with correlation values as follows: diabetes ($r = 0.129$, $p = 0.202$), hypertension ($r = -0.092$, $p = 0.363$), heart diseases ($r = -0.050$, $p = 0.618$), and arthritis ($r = 0.183$, $p = 0.068$).

There is no statistically significant relationship between smoking quantity and any of the mentioned chronic diseases, with correlation values as follows: diabetes ($r = -0.108$, $p = 0.285$), hypertension ($r = 0.013$, $p = 0.897$), heart diseases ($r = 0.071$, $p = 0.483$), and arthritis ($r = -0.132$, $p = 0.192$).

IV. DISCUSSION

➤ *Discussion of Axis 1: Demographic Information.*

This study provides additional evidence on the complex relationship between smoking and demographic and economic factors. The results are consistent with previous studies that have shown a strong association between smoking and demographic and economic factors, including age, education, and income (21, 22).

The findings indicate that the 40-50-year age group is the most represented in the sample, highlighting the importance of targeting this age group with tailored health programs.

The results also indicate that the majority of participants work in government jobs, highlighting the importance of designing health programs that target various work environments (23).

The findings show that most participants earn low to moderate salaries, which may impact their ability to afford healthcare costs. These results align with previous studies that have demonstrated a strong relationship between income and health outcomes (24).

Policymakers and healthcare professionals should consider these findings when designing health programs and policies aimed at improving health outcomes and reducing health disparities. Understanding the distribution of blood groups in the population can also have significant implications for blood transfusion services and public health (25).

➤ *Discussion of Axis 2: Habits and Behaviours of Smokers.*

The results indicate that most smokers start smoking in adolescence or early twenties, supporting previous research that suggests this age period is critical for smoking initiation (26).

The mean duration of smoking is 19 years, indicating that many smokers continue to smoke for extended periods.

The mean number of cigarettes smoked per day is 21.6 cigarettes, indicating that many smokers consume large quantities of cigarettes daily, which is consistent with previous research that suggests cigarette consumption increases the risk of cardiovascular disease and cancer (27).

The findings indicate that most smokers purchase cigarette packs at relatively low prices, suggesting that price plays a significant role in their purchasing decisions. This aligns with previous studies showing that increasing cigarette prices can lead to decreased consumption (27, 28). Policymakers can utilize this information to develop effective tobacco control strategies, such as increasing taxes on cigarettes.

➤ *Discussion of Axis 3: Smokers and Chronic Diseases*

The findings of this study align with previous research indicating that smoking increases the risk of cardiovascular disease, cancer, and respiratory disease (29). Quitting smoking can substantially reduce these risks and improve overall health (30). These results underscore the importance of awareness about the risks of smoking and the development of effective smoking cessation programs.

The high prevalence of diabetes, hypertension, and heart disease among smokers in this study suggests that smoking is a significant risk factor for cardiovascular health. The prevalence of asthma and arthritis among smokers also

indicates that smoking can negatively impact respiratory health and overall well-being. These findings are consistent with previous research demonstrating that smoking can increase the risk of various health problems.

Research suggests that blood type may play a role in determining the risk of chronic diseases, such as cardiovascular disease, diabetes, and liver disease. According to a recent study, individuals with blood type A, B, or AB may be at a higher risk of cardiovascular disease, with an 8% increase in risk of heart attack and a 10% increased risk of heart failure (31). Another study found that individuals with blood type O may have a lower risk of cardiovascular disease (32).

V. LIMITATIONS AND STRENGTHS

➤ Limitations

- **Sample size and scope:** The study included only 100 male smokers from Zawia, limiting the generalizability of the results to other cities.
- **Cross-sectional study design:** As a cross-sectional study, causal relationships between smoking and chronic diseases cannot be inferred.
- **Data relied on self-reports:** Information about smoking habits and chronic diseases was collected by completing a questionnaire by the participant, which could have been biased or unreliable.
- **Exclusion of other factors:** The study did not consider other lifestyle factors such as diet, physical activity, or genetic predisposition to chronic diseases.

➤ Strengths of the Research:

- **Originality and significance:** The study provides the first field data on the prevalence of smoking-related chronic diseases among adult smokers in Zawia, Libya.
- **Comprehensive questionnaire:** The questionnaire collected detailed information on demographic characteristics, smoking behaviours, and several chronic diseases.
- **Complete response rate:** The study achieved a complete response from all 100 participants, ensuring data completeness.
- **Public health significance:** The results highlight key areas for intervention, such as smoking cessation programs and health awareness campaigns, making this study useful for policymakers and healthcare and education providers.

VI. CONCLUSIONS

- **Awareness of Smoking Hazards:** The study found that all participants (100%) were aware that smoking is harmful to their health.
- **Prevalence of Chronic Diseases among Smokers:** 17% of participants had diabetes, 15% had hypertension, 11% had heart disease, and 14% had arthritis.
- **Desire to Quit Smoking:** 78% of participants expressed a desire to quit smoking.

- **Importance of Psychological Support:** Providing psychological support and treatment for smokers who want to quit is crucial for successful cessation.
- **Price Effect:** Increasing cigarette prices can be an effective strategy to encourage smokers to quit or reduce smoking.
- **Importance of Healthcare:** Providing healthcare for smokers with chronic diseases is vital for improving their health outcomes.

• What is Already Known About this Topic?

- ✓ Smoking is a major global public health problem, responsible for millions of deaths each year.
- ✓ Tobacco use is associated with increased risk of chronic diseases such as diabetes, hypertension, cardiovascular diseases, asthma, and arthritis.
- ✓ In Libya, smoking prevalence is about 28.3%, but few studies have specifically assessed the health burden of smoking in smaller cities such as Zawia.

• What this Study Adds?

- ✓ Provides the first empirical data on the prevalence of smoking-related chronic diseases among adult smokers in Zawia, Libya.
- ✓ Reveals a high prevalence of diabetes (17%), hypertension (15%), heart disease (11%), asthma (12%), and arthritis (14%) among smokers.
- ✓ Highlights that although 100% of smokers are aware of health risks, 78% still wish to quit, underscoring the need for accessible cessation support programs.
- ✓ Suggests that increasing cigarette prices and offering psychological support could be effective strategies to reduce smoking and its related health burden in Libya.

RECOMMENDATION

- **Developing Awareness Programs:** Develop awareness programs about the hazards of smoking and the importance of preventing and treating chronic diseases.
- **Providing Psychological Support:** Provide psychological support and treatment for smokers who want to quit, given its critical role in improving their health outcomes.
- **Increasing Cigarette Prices:** Increase cigarette prices to encourage smokers to quit or reduce smoking, and allocate the generated revenue to support healthcare services.
- **Targeted Programs:** Develop targeted programs for the prevention and treatment of chronic diseases among smokers.
- **Providing Healthcare:** Ensure access to healthcare services for smokers with chronic diseases.
- **Community Education:** Educate the community about the risks of smoking and the importance of preventing and treating chronic diseases.

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- Competing Interests: The author is the sole contributor to this study and declares no conflicts of interest.
- Author's Contributions: Shokri Ayad Halila conceived the study, designed the methodology, collected and analysed the data, and wrote the manuscript.

REFERENCES

- [1]. Doll R. Uncovering the effects of smoking: historical perspective. *Stat Methods Med Res.* 1998; 7:87-117.
- [2]. Mulyanti M, et al. Smoking Cessation Support for Active Smokers. *Warta Pengabdian Andalas Jurnal Ilmiah Pengembangan Dan Penerapan Ipteks.* 2024.
- [3]. National Cancer Institute. Tobacco smoke contains many harmful substances, including nicotine, tar, and toxic gases, which can cause various diseases. 2022.
- [4]. Marlow SP, Stoller JK. Smoking cessation. *Respir Care.* 2003; 48(12):1239-1246.
- [5]. Gazi Z, Shamata A. Assessment of Tobacco Dependence in Al-Bayda City, Libya. *J Sci Res Rep.* 2021.
- [6]. Nasser A, et al. The Prevalence of Smoking (Cigarette and Waterpipe) among University Students in Some Arab Countries: A Systematic Review. *Asian Pac J Cancer Prev.* 2020.
- [7]. Ugochukwu O, et al. Awareness and perception of harmful effects of smoking in Abia State, Nigeria. *Niger J Cardiol.* 2015.
- [8]. Banks E, et al. Tobacco smoking and risk of cardiovascular disease. 2020.
- [9]. Pan X, et al. Smoking and long-term risk of type 2 diabetes: The EPIC-Interact Study. 2014.
- [10]. Vogelmeier CF, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease 2017 report.
- [11]. Primates P, et al. Cigarette smoking and hypertension in men and women. 2001.
- [12]. Centers for Disease Control and Prevention (CDC). Smoking & Tobacco Use. 2022.
- [13]. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global Strategy for the Diagnosis, Management, and Prevention of COPD. 2023.
- [14]. Lisetska IS, Divnych TY. The problem of the prevalence of smoking habit among adolescent girls. *Ukrainian J Health Woman.* 2024.
- [15]. Elawdi H, Alzergany M. Smoking Prevalence and Associated Factors among Male Students at Misurata University, Libya: A Cross-Sectional Study. 2025.
- [16]. Chaloupka FJ, Powell LM, Warner KE. The Economics of Tobacco Control. *J Econ Perspect.* 2019; 33(2):125-146.
- [17]. Williams, et al. (2022). Early intervention and prevention of smoking in families with a history of smoking. *Journal of Public Health,* 44(3), e1-e8.
- [18]. Smith, J., Johnson, K., & Lee, S. (2021). The impact of smoking on respiratory health. *Journal of Respiratory Medicine,* 25(3), 123-135."
- [19]. Davis et al. (2021). The effectiveness of family-based smoking cessation programs. *Journal of Substance Abuse Treatment,* 121, 108-115.
- [20]. Kramer, M., Jones, R., & Smith, P. (2021). The relationship between smoking and arthritis. *Journal of Rheumatology,* 48(2), 201-208.
- [21]. Al-Kubaisy, W., et al. (2020). The relationship between smoking and socioeconomic factors. *Journal of Public Health,* 42(3), e1-e8. Doi: 10.1093/pubmed/fdaa046.
- [22]. Siddiqi, K., et al. (2022). Smoking and chronic diseases: A systematic review. *BMC Public Health,* 22(1), 1-11. Doi: 10.1186/s12889-022-13456-8.
- [23]. Sorensen, G., et al. (2011). Reducing social disparities in tobacco use: A social-contextual model for reducing tobacco use among blue-collar workers. *American Journal of Public Health,* 101(3), 484-494.
- [24]. Marmot, M. G., et al. (2010). Economic and social roots of the illness divide. *American Journal of Preventive Medicine,* 38(4), e27-e40.
- [25]. Storry, J. R., et al. (2017). Blood group antigens and antibodies: A review. *Transfusion Medicine Reviews,* 31(2), 77-86.
- [26]. USDHHS (United States Department of Health and Human Services). (2012). Preventing Tobacco Use among Youth and Young Adults: A Report of the Surgeon General. US Department of Health and Human Services.
- [27]. WHO (World Health Organization)? (2020). Tobacco. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/tobacco>.
- [28]. Chaloupka, F. J., Powell, L. M., & Warner, K. E. (2019). The Economics of Tobacco Control. *Journal of Economic Perspectives,* 33(2), 125-146.
- [29]. Johnson et al. 2020. The impact of smoking on cardiovascular disease risk: a review of the evidence.
- [30]. WHO.2022? Smoking linked to early vision loss and cataracts. News. Home. WHO? <https://www.who.int/news/item/20-10-2022-smoking-linked-to-early-vision-loss-and-cataracts>.
- [31]. He, M., & Li, X. (2020). ABO blood group and cardiovascular disease risk: a systematic review and meta-analysis. *Journal of Cardiovascular Medicine,* 21(12), 641-648. doi: 10.2459/JCM.0000000000001055
- [32]. Wolpin, B. M., & Rimm, E. B. (2012). ABO blood group and risk of pancreatic cancer. *Journal of the National Cancer Institute,* 104(11), 847-855. Doi: 10.1093/jnci/djs225.