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Tobacco Smoking in Gezira state, Sudan, Results from STEPS survey 2017-2020

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Abstract

Background

Tobacco smoking is a risk factors for non-communicable diseases (NCDs). The WHO says that up to half of smokers die from tobacco usage. Various studies investigated the prevalence and association of tobacco smoking in Sudan, but few studies reported Gezira state.

Objectives

To determine the magnitude of smoking and its association in Gezira state, Sudan.

Methods

Using the WHO STEPwise approach to chronic disease risk factor surveillance, a population-based, cross-sectional, multi-stage clustered sample survey was conducted in 2017-2020 on 648 participants aged 18–64 years. Socio-demographic and behavioral risk factors, Physical anthropometric measurements, blood pressure, blood cholesterol and glucose levels were collected in 3 steps.

Results and Conclusion

The study showed a smoking prevalence of 10.76 %. There was no significant association between residence smoking and no association between smoking and glucose or cholesterol levels.

However, there was an association between smoking and gender but no association between smoking and age groups or marriage.

There was an association between snuff and gender, age, and residence but no association with blood glucose or cholesterol.

There was no association between residence and second-hand smoke at home whereas there is an association with second hand-smoking at work,

Also, the research found no association between secondhand smoke at work or home, and gender or marriage. However, no association between secondhand smoke at home or work and blood pressure.

These data could be useful in the formulation and advocacy of NCD policy and action plans in Gezira.

Keywords: Gezira, NCDs, Smoking, Tobacco

Introduction

Non-communicable diseases (NCDs), also referred to as chronic diseases, are the leading causes of death worldwide, claiming the lives of more than three in five people worldwide. NCDs kill around 41 million of the world's population each year, 71% of all deaths worldwide (WHO, 2018) [36]. NCDs will steadily increase the number of healthy years (or disability-adjusted life years-DALYs) lost in middle-income countries, but the loss will increase very quickly in low-income countries. By 2030, low-income developing countries will have eight times more fatalities attributed to NCDs than high-income countries (Bigna and Noubiap, 2019 and Masaebi *et al*. 2021) [7, 21].

Diseases responsible for the majority of NCD-related illnesses and death are cardiovascular diseases, cancers, diabetes, and chronic respiratory diseases. These four, along with mental illness have a high cost on the developing world, costing around $21 trillion over the next two decades. This heavy economic impact and financial burden, raised special attention to the growing problem, especially after a 2011 high-level meeting on NCDs at the United Nations (Heller *et al*., 2019) [12].

The main behavioral risk factors of NCDs are tobacco use, harmful use of alcohol, insufficient physical activity, and an unhealthy diet. More than half of the NCD burden could be avoided through health promotion and prevention initiatives (Mikkelsen *et al*, 2019) [22]. Focusing on strengthening protective factors and earlier investment in the prevention of NCDs among young people is, therefore, more essential than treatment options for controlling and fighting NCDs (Witter *et al*., 2019).

One of the most serious risk factors is tobacco smoking. The WHO says that up to half of smokers die from tobacco usage.

Each year, more than 8 million people are killed by tobacco. Over 1.2 million of those fatalities are caused by non-smokers being exposed to secondhand smoke, while more than 7 million are caused by direct tobacco use. More than 80% of the 1.3 billion tobacco smokers worldwide reside in low- and middle-income nations in 2020, 36.7% of all men and 7.8% of all women consumed cigarettes. This represents 22.3% of the world's population (St Claire, *et al*., 2020 and WHO 2018) [32, 36].

The WHO Framework Convention on Tobacco Control (WHO FCTC) was ratified by WHO Member States in 2003 to fight the tobacco epidemic. As of right now, 182 nations have ratified this agreement. However, Various studies have investigated prevalence and association in Sudan, but few studies reported Gezira state (Zhou *et al*., 2018) [38].

Survey Design

This is a cross-sectional, stratified, multi-stage clustered sample survey. It is a household-based survey covering all-state.

The target population:

The survey is a community-based survey targeting individuals in specific age groups for both sexes, ages 18 - 64.

The frame:

In this study, a frame of all Enumeration Areas (EA), Popular Administrative Units (PAUs), Administrative Units (AUs), and Localities, in the whole country was obtained from the CBS according to the 2008 Census. The mapping of these EAs is up-to-date from the recent census.

The size of each EA is known exactly, stable, and suitable for fieldwork.

Sample Design:

A simple random sampling of individuals is not practical in large populations A better strategy, therefore, was to use a cluster design, in which some clusters are in different places, and then a suitable number of HH (individuals) from each cluster, are chosen. The key to the survey design was deciding how many clusters and how many units in each cluster to choose so that the sample obtained is sufficiently large. For this survey, stratification was done by:

a-The region level, and rural/urban. b-The age-group level. c-The gender level.

Sample Size:

The data collection for the stepwise survey was conducted jointly with the Poverty Survey. However, the sample size had been calculated independently for each survey because of different overall purposes. The poverty survey's main goal was to compare states, while the scope of the current survey is to compare people across age groups and gender. The sample size was calculated using the WHO template (Fig 1):

The formula used for the calculation of the sample size is:

$$n = \frac{z^2 * p(1-p) * deff}{(\epsilon p)^2 (1-r)} * 2 * 6$$

where:

n = the required sample size, (number of HHs, individuals)

z = the value in the normal distribution that gives a level of confidence of 95% (z = 1.96)

p=the prevalence of the most important indicator in the study (0.5).

r = non-response rate (r = 10%)

deff = the design effect, (deff = 1.5)

ϵ = the relative margin of error at 95% confidence (RME=0.10).

2= The number of gender groups.

6= The number of regions.

Substitution in the formula gives:

$$n = \frac{1.96^2 * (0.5)(1-0.5) * 1.5 * 2 * 6}{\{(0.10)(0.5)^2 (1-0.10)} = 7684 \text{ individual} = 7700$$

Accordingly, the total number of clusters in Sudan in the survey will be:

7700/27 = 285 (each cluster is 27 HH)

the total number of clusters in Gezira State in the survey will be:

285/ 12 = 24

Accordingly, the total number of HH in Gezira State in the survey will be 24*27 =648

Fig 1

However, in this survey, p=0.5 is adopted to allow:

1. Getting good estimates for all parameters of interest and,
2. Getting reasonable estimates for all parameters under study for each region considered.

This formula is applied to each region separately. The other values used in the formula are fixed to all regions. The sample for each region is calculated as proportional to the size (population) of the region. The sample size is given above.

Finally, the number of clusters and the number of households (HH) in each cluster must be decided. The choice is between having more clusters and fewer HH in each and having fewer clusters and more HH in each, in such a way as to give the necessary overall sample size.

On the other hand, in this study, it is expected that all variables related to NCD, e.g., smoking, are almost similar in HHs situated in one cluster. There will be no new information if we select a large sample from within clusters. It was suggested to select 27 HH from each cluster. This, of course, matches with the design of the poverty survey in which 27 HHs are selected from each cluster.

Accordingly, the total number of clusters in the survey will be:

7700/27 = 285

This will be distributed proportionally between the 11 selected states.

The following table gives the selected sample distribution of clusters, as urban and rural

State	N0. HHs	Number of urban clusters	Number of rural clusters	Total
Gezira	648	12	12	24

Fig 2

Modified 27 *24 = 648 (Fig 2)

As for the selection of the HHs, the same 27 HHs in the Poverty Survey will be taken. Then the selection of the individuals within the HH will be done through Kish Method.

Sample Selection:
In this study, the sample design was a three-stage cluster sample:
First Stage: the first stage was the selection of the Primary Sampling Units (PSUs), which were (the Clusters) of the EAs in the region. The selection of the PSUs was through Probability Proportional to Size (PPS). Clusters chosen from units with many people had to be given more weight than clusters chosen from small units. This weighting was necessary both statistically and logistically, to make the sample "self-weighting".
Second Stage: the second stage was the selection of the Secondary Sampling Units (SSUs), which were the households (HHs). This selection was done using systematic random methods.
Third Stage: the third stage was the selection of the Tertiary Sampling Units (TSUs), which were individuals aged 18-64. This selection was done using Kish Method.

Data collection:
Data were collected using the WHO stepwise questionnaire for NCDs risk factors with some modifications (annex 1). Step 1 provides personal data, socioeconomic data, and basic data on behavioral risk factors (nutrition, tobacco use, and physical activities). Step 2 is physical measurements which provide data on height, weight, waist and hip circumference, blood pressure, and heart rate. Step 3 is composed of biochemical measurements which provide data on sugar and lipids. The data was collected by trained teams; each composed of a medical doctor (as a team leader), a social worker, a health worker, a laboratory technician, and a driver.

Quality and Data Management:
Data was collected using I pads. A system for quality assurance was implemented to ensure the study is performed to a high standard. Monitoring during the study helped in reducing missing data.

Pilot test:
Where possible the pilot test was conducted under realistic field conditions. The timeframe when planning the pilot test, allowing sufficient time for adjustments was made before starting data collection. The pilot test gave feedback on the applicability of the questions and how clear it was. It also allowed us to Evaluation and refine the Instrument.

Ethical clearance
The research team obtained two copies of the written informed consent forms. The selected individual had the right to refuse or accept to participate in the survey. Interviews were conducted in a manner that ensured confidentiality and privacy. Ethical clearance was obtained from the state ministry of health ethical committee.

Fieldwork
The work started on the state's 40 Administrative units. Deployment of teams-Immediately after training, interviewers were divided into 2 teams of 5 each including a team leader (statistician), health worker, social worker, and a driver (who were shared for every locality). In each locality, teams worked 8 hours a day. Every supervisor supervised 2 teams and 1 supervisor for each locality.
Each Team leader/interviewer completed the questionnaire with participants. The Team leader/interviewer was also responsible for checking the completeness of questionnaires, consent forms, sugar and lipids measurement, and general entry approach to the household and community. The health worker was responsible for measurement and reporting of Physical measurements including blood pressure, height, weight, waist, and hip circumference measurements.

Data analysis:
Data entry was done using I pads. The data were further sent to the server website. The data was revised and cleaned from the outliers. Further analysis took place using SPSS version 26.

Monitoring of the study
The main supervisor monitored the study. The activities included reporting the progress and verification of the date. There were two components to monitoring: Data Management and data quality.

Results

Table 1: Locality residence and its associations

Association (chi-square Test)	P.Value	Comment
Locality residence and second-hand smoking work	0.00	Highly Significant
Locality residence and smoking health promotion massages at TV	0.00	Highly Significant
Locality residence and smoking health promotion messages at radio	0.00	Highly Significant
Locality residence and number of vegetables consumed a day	0.00	Highly Significant
Locality residence and second-hand smoke at work	0.00	Highly Significant
Locality residence and health promotion messages in newspaper	0.00	Highly Significant
locality residence and cloth advertise smoking tobacco policy	0.00	Highly Significant
Locality residence and history of raised total cholesterol	0.00	Highly Significant
Locality residence and marriage	.010	Highly Significant
Locality residence and history of raised BP	.010	Highly Significant
Locality residence and health promotion messages at stores	.054	Significant
Locality residence and current smoking	.319	Not significant

Locality residence and history of smoking in the past	.704	Not significant
Locality residence and current use of snuff	.795	Not significant
Locality residence and second-hand smoking at home	.622	Not significant
Locality residence and have diabetes	.218	Not significant

Table 2: Smoking and its associations

Association (chi-square Test)	P.Value	Comment
Tobacco smoker and gender-demographics	0.00	Highly Significant
Tobacco smoker and physical activity?	0.00	Highly Significant
Tobacco smoker and measurement of diabetes	.019	Significant
Tobacco smokers and smoking advertisements in stores	.049	Significant
Tobacco smoker and marriage	.896	Not significant
Tobacco smokers and age groups	.170	Not significant
Tobacco smokers and smoking health promotion messages on radio	0.624	Not significant
Tobacco smokers and smoking health promotion messages in stores	.303	Not significant
Other use in the past and measurement of diabetes?	.621	Not significant
Tobacco Smoking and systolic blood pressure	.708	Not significant
Tobacco smoking and diastolic blood pressure	.779	Not significant
Tobacco smokers and blood glucose levels	.876	Not significant
Tobacco smokers and total cholesterol levels	.843	Not significant

Table 3: Snuff and its associations

Association (chi-square Test)	P.Value	Comment
Use of snuff and gender- demographics	0.00	Highly Significant
Use snuff and smoking health pro massages in stores	.008	Highly significant
Use of snuff and Measurement of BP	.013	Significant
Use snuff and age groups	.061	Not significant
Use snuff and smoking health promotion messages on the radio	0.075	Not significant
Use snuff and systolic blood pressure	.118	Not significant
Use snuff and systolic blood pressure	.829	Not significant
Use snuff and blood glucose levels	.973	Not significant
Use snuff and total cholesterol levels	.924	Not significant

Table 4: Secondhand smoking and its associations

Association (chi-square Test)	P.Value	Comment
Use the secondhand smoking home and smoking health pro massages in stores	.001	Highly significant
Use secondhand smoking work and gender-demographics	.008	Highly significant
Use the secondhand smoking home and physical activity?	.008	Highly significant
Use the secondhand smoke home and age groups	.815	Not significant
Use secondhand smoking home and marriage	.377	Not significant
Use the secondhand smoke home and smoking health promotion messages on the radio	.133	Not significant
Use the secondhand smoking home and blood glucose levels	.973	Not significant
Use the secondhand smoking home and blood total cholesterol	.571	Not significant
Use secondhand smoking work and blood glucose levels	.721	Not significant
Use secondhand smoking work and blood total cholesterol levels	.777	Not significant
Tobacco smoking health pro massages on TV and blood glucose	.839	Not significant
Tobacco smoking health pro massages on TV and total cholesterol levels	.525	Not significant

Table 5: Blood pressure and its smoking associations

Smoking and systolic blood pressure	.708	Not significant
Smoking and diastolic blood pressure.	.779	Not significant
Snuff and systolic blood pressure	.118	Not significant
Snuff and diastolic blood pressure	.829	Not significant
Secondhand smoking at home and systolic blood pressure	.187	Not significant
Secondhand smoking at home and diastolic blood pressure	.092	Not significant
Secondhand smoke at work and systolic blood pressure	.746	Not significant
Secondhand smoking at work and diastolic blood pressure	.405	Not significant

Discussion

The average percentage of smoke used in Gezira is 10.76 % (SE 2.31 SD 11.5). According to WHO (2018) [36], around a third (33.3%) of the world's population (both sexes combined) who were 15 years of age or older used tobacco regularly in 2000. By 2015, this percentage had decreased to roughly 24.9% of the world's population. In 2020, 36.7% of males and 7.8% of women worldwide used tobacco, accounting for 22.3% of the global population. By 2025, the rate is expected to drop even further to about a fifth (20.9%) of the world's population, assuming that all countries maintain their existing tobacco control measures (Kataoka, 2021 [17] and WHO 2018 [36])

According to the WHO, 2018 [36], more than 80% of the 1.3 billion tobacco smokers worldwide live in low- and middle-income countries. In all WHO regions, the age-standardized rates of tobacco use prevalence are decreasing. The region of South-East Asia is thought to have had a total tobacco consumption rate of about 47% in the year 2000 (Bray *et al*., 2020). For any WHO area, this rate was the highest average. The African region had the lowest average rate, which was projected to be 18.5%. These two locations have remained the highest and lowest average

African countries reported various prevalence of smoking. Zambia reported daily tobacco use of (10.7%) (Pengpid and Peltze, 2020) [27], while Roble *et al*., (2021) said that the prevalence of cigarette smokers in Ethiopia is 28.0%. Al-Mawali *et al*., 2021) reported that the prevalence of tobacco use in Oman was 9%. Not far from Sudan, Egypt reported a 10 % prevalence of smoking according to Fouda *et al*. (2018) [14].

However, there is no association between residing in the locality and current smoking or smoking in the past (Chi-square =.319, d. f =5 and chi-square =.704, d.f =5 respectively) (Table 1). Additionally, there is no association between smoking and blood glucose and cholesterol level (Chi-square =.876, d.f =5. and chi-square =.843, d.f =5 respectively) (Table 2) A Sudanese study by Awadallah *et al*., (2018), showed that the prevalence of smoking was 33.9%. Elderly, married men were significantly associated

with smoking. Awadallah *et al*., (2018) also stated that smoking is statistically associated with higher levels of triglycerides and glucose levels (P values 0.01 and 0.05, respectively), as well as ischemic heart disease (IHD) (P value 0.05). However, low-density lipoprotein (LDL), cholesterol, body mass index (BMI), and hypertension, were not statistically associated with smoking.

However, there is a highly significant association between smoking and gender in Gezira (Chi-square =.000, d.f =5) (Table 2). In Sudan's STEPS survey 2016, Khartoum had the greatest overall prevalence of male current smokers (22.3%) while the Northern region had the lowest (14.2%). Male smokers were most likely to smoke every day (19.9%) in Khartoum and least likely (8.4%) in the Northern region. Males started smoking manufactured cigarettes on average when they were 18.1-20.1 years old and smoked (7.5–9.6) cigarettes daily (Pengpid and Peltzer, 2022) [28].

Papathanasiou *et al*. (2012) [26] Greek study showed there are no significant differences in smoking prevalence between the sexes. The Greek study showed that 14.2% of research participants had high levels of physical activity (PA), which is known to improve health, while 45.4% were considered to be inadequately active (low PA class). Men were more physically active than women. An adverse relationship between smoking and PA was found by logistic regression analysis, and this relationship was stronger in men. Smoking was linked to noticeably lower probabilities of engaging in either moderate or vigorous physical activity. PA was similarly inversely correlated with smoking frequency, but the association was stronger in females.

Our study showed no association between smoking and age groups or marriage (chi-square =.171, d.f =5 and chi-square =.896, d.f =5, respectively) (Table 2), however, the study showed an association between smoking and physical activity (chi-square =.000, d.f =5) (Table 2). According to a Finnish study by Salin *et al*. (2019) [30], throughout 31 years, 3355 participants were assessed over smoking and physical activity. People who are consistently active or become more active over time have significantly lower odds of falling into the highest-risk smoking categories.

The study shows no association between Smoking and blood pressure (chi-square =.708, d.f =5 and chi-square =.779, d.f =5, respectively) (Table 5). Rafique *et al*., (2018) [29] reported that 19.7% of people in Pakistan's STEPs survey, 2013–2014 used cigarettes regularly. Stage I and stage II hypertension were more common among smokers, even among those taking medication, at 37% and 15.9%, respectively.

Snuff

Snuff is widely used in Sudan. The centers for disease control and prevention (CDC) state that smokeless tobacco products like snuff have several serious health risks. Some of the risks are nicotine addiction, pancreatic, oral, and esophageal cancers, in addition to oral and dental health problems.

The chi-square test shows that there is no association between using smokeless tobacco (snuff) and residing in the locality (chi-square =.319, d.f =5) (Table 3). Furthermore, there is no association between using smokeless tobacco (snuff) and blood glucose or cholesterol level (Chi-square =.973, d.f and =5 and Chi-square =.924, d.f =5 respectively) (Table 3). However, there is an association between using snuff and gender and age groups (chi-square =.000, d.f =5) (Table 3), with the biggest percentages of users among men in the 30-44 and 45-59 years categories (17.5% and 18.8%, respectively). Carlsson *et al*. (2019) [11] stated that usage of Swedish smokeless tobacco (snuff) and tobacco use, in general, was linked to an elevated risk of type 2 diabetes (T2D). The survey, conducted between 1998 and 2006 and participants were tracked through the Swedish patient registries until 2015, showed that T2D risk was higher for current smokers (HR 1.69, 95% confidence interval (CI), 1.49-1.92) and snuff users (HR 1.19, 95% CI, 1.01-1.41).

Sing *et al*. (2019) conducted a study among the adult population in India using multivariate binary logistic regression models, and the relationship between alcohol, cigarette use, and smokeless tobacco use and hypertension was investigated. When compared to non-users of snuff, male smokers of smokeless tobacco had the highest odds of becoming hypertensive (OR: 2.32, 95% CI: 1.99-2.71). In comparison to women who did not use any drugs or alcohol, those who smoked and those who used any smokeless tobacco had greater odds of having hypertension by 71% (OR: 1.71, 95% CI: 1.14-2.56) and 51% (OR: 1.51, 95% CI: 1.25-1.82), respectively. An integrated and more targeted strategy targeting alcohol and cigarette usage is required to reduce the prevalence of hypertension in the community. Furthermore, Musa *et al*., (2019) [23] cross-sectional study in Maiduguri, northeast Nigeria, concluded that snuff leads to changes in lipid profiles, a rise in BMI, and blood pressure, all of which are risk factors for cardiovascular disease.

Secondhand smoking

The WHO concluded that air pollution in homes and the environment (13% and 17%, respectively) as well as secondhand smoke (3%), account for roughly one-third of the burden of cardiovascular disease globally (Baumgartner *et al*., 2020 and Manisalidis *et al*., 2020) [4, 20]. According to researchers' data from 68 low-income and middle-income countries say that 55.9% of teenagers had been around secondhand smokers in recent years (Wang *et al*., 2017). However, Sudan showed 22.1% of exposure to tobacco in work in the 2016 STEPS survey, 30.4% among males and 12.4 % among females. Males aged 18-29 years showed the highest exposure (33.7%).

The survey reveals no association between residing in the locality and secondhand smoking at home (Chi-square =.622, d. f =5) (Table 1), whereas there is an association between residing in the locality and second-hand smoking at work (Chi square=0.000, d.f=5) (Table 4). Othman *et al*. (2021) [25] conducted a study in Sudan, Khartoum of 3387 students where 42.7% of the participants were men, and 57.3% were women. There were 48.4 and 51.6% of students from private and public schools, respectively. The total number of people who had ever used smokeless tobacco was 7.6%; 11.0% among males and 5.0% among females. The risk factors of second-hand smoking were being male (OR 1.53 CI 95% 1.03-2.28), family structure (OR 1.52 CI 95% 1.03-2.23), being exposed to secondhand smoke at home (OR 1.60 CI 95% 1.11-2.31), lack of restriction of selling tobacco to minors (OR 1.73 CI 95% 1.25–2.39), promotion of smokeless tobacco (OR 2.12 CI 95% 1.20–3.72) and low self-efficacy (OR 7.47 CI 95% 4.45–12.52).

Furthermore, Gezira STEPS found no association between secondhand smoking at work or home and gender or marriage (chi-square =.008 d.f =5 and chi-square =.570 d .f =5) (Table 4). Bhatt *et al*., (2018) [6] study of exposure to

secondhand smoke and its correlates in the Northern State of India concluded that those living in urban areas, females, and having a low level of education had higher odds of being exposed to SHS at home (odds ratio [OR] = 2.2, 95% confidence interval [CI] = 0.6-7.3). SHS exposure was higher at work (OR = 3.9 and 95% CI = 1.11-14.3) for males, primary and middle education, and self-employed.

Brath *et al*. (2021) said that smoking and secondhand smoke strongly increase the incidence of diabetes and the probability of its complications. Kim, *et al*. (2017) [19] say that home exposure to secondhand smoke in Korea has been linked to poor glycemic control. Therefore, healthcare professionals should inform diabetes patients about the risks of secondhand smoke to help them avoid it. In contrast, the study shows no association between second-hand smoking at home or work and blood glucose or cholesterol level (Chi-square =.973, d.f =5 and Chi-square =.721, d.f =5, Chi-square =.571, d.f =5 respectively) (Table 3).

Secondhand smoking and blood pressure

According to the European society of cardiology, Professor Byung Jin Kim, of Sungkyunkwan University says "Avoid exposure to secondhand smoke regardless of whether the smoker is still in the room. Our study in non-smokers shows that the risk of high blood pressure is higher with longer duration of passive smoking, but even the lowest amounts are dangerous." (Timmis *et al*., 2019) [33].

There is no association between secondhand smoking (SHS) at home and systolic or diastolic blood pressure (Chi-Square =.187 d.f =20 and Chi-Square =.092 d.f =20 respectively) (Table 5). However, there is no association between SHS at work and blood cholesterol level (Chi-square =.777) (Table 4). Kim's study, 2019 stated that SHS exposure was significantly associated with hypertension, 13% increased risk of hypertension was linked to Passive smoking, while 15% of the risk was linked to living with a smoker after the age of 20. exposure to passive smoking for more than 10+ years was associated with a 17% increased risk in both sexes. The odds of developing hypertension were substantially higher after current SHS exposure than those with no (SHS). Furthermore, there was no discernible gender association with SHS exposure. Differently, the survey concluded that There is an association between using secondhand smoke at home and gender (Chi-square =.045 d.f =5) (Table 3).

Bernabe-Ortiz and Carrillo-Larco analyzed data from 897 individuals in Peru, in 2021, with a mean age of 38.2 (SD: 11.8) years and a female majority of 499 (55.7%). Individuals reported second-hand smoke exposure to be 8.7% at home and 8.3% at work. Second-hand smoking was linked to hypertension, a higher Framingham cardiovascular risk, and a 0.2% higher 2019 WHO risk score (PR = 2.42; 95% CI: 1.25-4.67).

However, the Gezira NCDs survey shows no association between secondhand smoking at work and age groups (Chi-square =.851, d.f =5). Bhatt (2019) say that the odds of having their own BP measured increased with age among men but decreased with age among women, however, Bufard 2016 says that this age-related increase in the prevalence of hypertension among women is caused at least partially to the rapid decrease in sex hormones.

The study shows a highly significant association between smoking messages on TV and radio and locality (Chi-square =.001, d.f =5). Bala *et al*., (2017) [3] say that there is evidence that comprehensive tobacco control programs, which include media advertising, can be successful in altering adults' smoking behaviors. however, the research supporting this claim is diverse and of varying methodological quality. Massachusetts's statewide tobacco control program produced successful results up to eight years after the campaign.

Programs/campaigns intended to encourage a certain activity connected to smoking have had varying degrees of success, largely dependent on the advertising strategy used. The effectiveness of mass media cessation clinics has been demonstrated; media plus social support was found to be more successful than viewing plus printed material, and both combinations were found to be superior to viewing alone. Research investigations are required to expand our knowledge and create a science of mass media health promotion, as opposed to straightforward evaluations (Bafunno *et al*., 2020 and Bala *et al*., 2017) [2, 3].

Another state (California) demonstrated promising outcomes both throughout the program's final evaluation and during the period of adequate funding and implementation. The effectiveness of mass media campaigns may be influenced by their duration and intensity, although it can be challenging to measure due to follow-up time and concurrent secular trends and events. Campaign efficacy did not appear to be associated with age, education, ethnicity, or gender (Bala *et al*., 2017 [3] and Kalkhoran *et al*., 2018 [16]).

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