The Efficacy of Viewing Health Warnings on Shisha Smoking among Shisha Smokers

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

As shisha smoking is increasing globally, the need for a critical action to control shisha smoking consumption becomes crucial. Despite the success of cigarette warning labels in increasing smokers' awareness of the negative health effects of smoking and in motivating smokers to quit, nothing is known about the potential impact health warning labels may have on shisha users.

The current study investigated the perception of effectiveness of text-only versus graphic warning among shisha smokers. This study sought to examine the impact of viewing health warning labels on perceived susceptibility and severity of shisha smoking health hazards, on motivating intentions to quit, and on changing the pattern of shisha smoking.

Eligible participants first completed an online baseline questionnaire, and were then randomly assigned to one of three conditions:a control condition, in which they viewed nutrition labels *(n*=100) , or one of two experimental groups in which they viewed Text- only warning labels (*n*=117), or they viewed Graphic warning labels (*n*=125). In each of these three conditions, participants viewed six health warning labels and rated them using likert scale questions immediately following each label. Two weeks later, participants were invited to complete an online follow-up questionnaire.

The findings indicate that Graphic tobacco warnings grab participants' attention and elicit unfavourable emotional reactions. Although there was a relatively little impact of viewing health warnings on subsequent shisha use, Graphic warnings significantly improved some of the participants' health knowledge .In addition,

Graphic warnings significantly increased smokers' beliefs that shisha is harmful to health and dangerous to non-smokers. Patterns of the findings revealed that quit intentions were relatively higher among those who viewed Graphic warning labels.

Further examination of specific themes and contents of health warnings directed specifically to shisha smokers in different cultural settings will be critical to ensure the relevance of health warnings in distinct cultural settings.

To our knowledge, this study is the first to examine the effect of health warnings on shisha smokers. Overall, findings provide modest support for the efficcacy of shisha warnings on establised users. Findings imply that packaging and labelling policies for shisha and shisha products require additional development.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION & OVERVIEW

Shisha (water-pipe) smoking is a customary and cultural method of tobacco consumption in many parts of the world including the Middle East, Southeast Asia, and North Africa (1). Shisha smoking is also known by many other names depending on the region of use, in India, where shisha smoking originated, it is known by the name “Hookah;” in many Arab countries such as Egypt, Kuwait, Bahrain, Qatar, Oman, UAE, Saudi Arabia, Morocco, Tunisia, Somalia and Yemen, it is known as “Shisha;” in Turkey, Greece, Cyprus, Armenia, Azerbaijan, Lebanon, Iraq, Jordan, Israel, and Syria, it is recognized as “Nargeela,” or “Argeela;”while in Albania, Bosnia, and Croatia, common names include "Lula,” or “Lulava” (2).

Despite the variety of names, all water-pipes are similar in the main structure. They are all composed of a bowl at the base that differs in size, which is usually partially filled with water. A hosepipe is connected at one end to the top of the water bowl and at the other end to a mouthpiece through which the smoker inhales the smoke emitted by the heated tobacco via a burned charcoal, which is located on top (1,3).

The types and amount of tobacco used vary widely. One of the most common types of tobacco used is “Mu'essel” or “maasel.” It is composed of 30.0% tobacco and 70.0% honey as well as various added flavors such as apple, mango, banana, strawberry, orange, grape, mint, or cappuccino ; those flavors give the shisha its appeal and distinctive aroma. Another type of tobacco used is “Tumbak,” or “Ajami,” which is a strong unmixed paste of tobacco. There is also “Jurak,” which is usually mixed with fruits or oils (4).

There is a common misconception that shisha is less harmful and less addictive than smoking cigarettes (5). This misconception could partly be due to the presence of water in shisha as it is believed that this filters the harmful ingredients present in tobacco (6). The indirect combustion of tobacco and apparently the "healthy" additives such as honey and fruit flavors may also contribute to misconceptions of harmfulness (6). However, studies have shown that shisha smokers are exposed to very high levels of carbon monoxide, nicotine, tar, and heavy metals as high as, or even higher than cigarette smokers (5). Studies have also linked shisha smoking to a number of cancers, including lung, esophageal, urinary, and bladder, as well as chronic obstructive lung diseases, emphysema, and asthma (6). Furthermore, shisha smoking has been identified as a vector for the spread of infectious diseases, such as Pulmonary Tuberculosis, from sharing the same mouth piece (4). Finally, shisha smoking is a potent source of Environmental Tobacco Smoke (ETS), due to the side-stream smoke generated during shisha smoking. Daher et al. (2009) demonstrated that during a one hour session of shisha smoking of just one water-pipe, the side-stream smoke contained levels of toxicants and carcinogens that are comparable to the amount produced from smoking 2-10 cigarettes (7).

Shisha smoking has been practiced in many Middle Eastern countries for more than three centuries (5). For years, shisha smoking was confined to retired men as part of social gatherings. In recent years, however, there has been an increase in shisha smoking worldwide among different age groups (7, 8, 9). Shisha smoking has become more accepted and widely used among young smokers, especially university and high school students of both genders (2). This broadening of shisha use could be partly due to the misconception that shisha smoking is less harmful and less addictive than cigarettes, or to a perceived positive image of shisha and smoking as being sociable

(5) and more appealing (10). In addition, younger age groups have more spare time and financial assets, both factors which increase the likelihood of shisha smoking (11).

The prevalence of regular shisha smoking in Middle Eastern countries has been estimated to range between 11.0-32.0% (12-16) with a constant rise in this percentage (17, 18). Shisha smoking among university students ranges between 32.0% (15) and 62.6% (16).

Very little research has been conducted on shisha in the developed countries, therefore the prevalence of shisha smoking in these areas is largely unknown (19). However, preliminary studies have found that the majority of shisha smokers are university students (19,6). Studies conducted in universities in both Britain and the USA found that shisha smoking among university students ranged between 8.0-15.0 %.(19, 6, 20). A Canadian study found that 23.0% of a sample of 871 eighteen to twenty-four years old smoked shisha in the past year and that 5.0% had used one in the past month (21). The Canadian tobacco use monitoring survey (CTUMS), 2011 reported that 81,000 of young Canadian adults aged 20-24 years had smoked shisha in the past 30 days of the survey (22).

The widespread use of shisha and the lack of knowledge regarding the health effects of its use indicate the need for effective tobacco control policies to tackle this growing problem.

Evidence on the effectiveness of cigarette health warning labels in enhancing anti-smoking awareness and promoting cigarette cessation in the developed world and a number of developing countries (23-33) has been well established. The

implementation of health warnings on cigarette packages has been shown to be among the most effective and cost-effective ways to reduce tobacco use. Therefore, an investigation of the effectiveness of such approach in controlling shisha smoking is crucial to integrate possible actions that could be adopted to control shisha smoking consumption.

The current study seeks to examine whether health warnings would also prove to be effective among shisha-users. Specifically, this study seeks to examine the impact of health warning labels on perceived susceptibility to shisha smoking and perception of risk about shisha smoking. It will also examine the impact of health warnings on the motivation to quit, and on changing the pattern of shisha smoking.

To our knowledge this is the first study to examine the potential impact of health warnings on shisha users. This study has the potential to contribute to the evidence regarding the potential impact of warning labels on perceptions and attitudes about shisha smoking. The results will lay the foundation for additional research and policies regarding health warnings on shisha and will help initiate priority actions for the prevention of shisha smoking.

2.0 LITERATURE REVIEW

Tobacco use poses devastating threats to populations, whether by affecting their health, the environment, and/or by imposing a financial burden on governments (5).

Key tobacco control policies have been implemented in western countries leading to a significant decrease in the rate of cigarette smoking. However, while cigarette smoking is decreasing, there has been an emergence in the use of alternative tobacco products, such as shisha (34). Although, shisha smoking is a deeply rooted cultural practice from centuries ago in the developing world, in recent years it has become an especially pervasive smoking habit in western countries. Currently, around 100 million people worldwide smoke shisha on a daily basis (35).

2.1 Description of Shisha Components

2.1.1 The Base

The base of a shisha is composed of a water container in which either plain or flavoured water is added. The added flavours are either fruit juice, coconut, vanilla, roses, or mint leaves (36).

The water base is responsible for soothing and moistening the smoke coming from the heated tobacco when it passes through the water. The water container is typically made of glass, but can also be made of ceramic, rock-crystal or metal (2, 3).

2.1.2 The Top

At the top of the shisha there is a holder bowl, which resembles a funnel in shape. Tobacco and charcoal are placed inside the holder one on top of the other. During the smoking session, the bowl is filled with tobacco. Tobacco is covered with

perforated aluminum foil filled with heated charcoal to burn it at the appropriate temperature (2,3).

In many Arab countries, this holder bowl is called “Korsi” and the load of tobacco inside it is known as “Hagar” (3). Under the holder, there is usually a plate, which acts as an ashtray to trap the residue dropping from the heated charcoal (2).

2.1.3 The Body

A connection pipe is present between the base and the top. Between the water bowl and the stem connection pipe, a rubber hose is attached. This hose allow for the suction of air from above the water. The length of this hose and the water together cool off the smoke drawn from the heated tobacco. At the end of the hose, there is a mouthpiece, which is either permanently attached to the hose or is changeable. The changeable mouthpiece is the one that is most commonly used, in order to prevent infectious diseases (3).

2.2 Steps of Shisha Smoking

To start the smoking session, the water container must be filled with water (some additives may apply) and the tobacco must be placed at the top to be heated via charcoal combustion. When the smoker starts inhaling the air from the shisha through the mouthpiece, which is connected to the pipe, a negative pressure is created, pulling the air from above the smoldered charcoal, sending it to the tobacco to burn. The smoke is carried through the stem pipe to reach the water, where the smoke bubbles and is filtered, and finally passes through the hose to the smoker (2).

2.3 History and Different Names of Water-pipe

Water-pipes are known by different names in different countries, all originating from India, Turkey, Persia, and other Arabic countries. ‘‘Shisha,’’ which means glass,

‘‘boory,’’ or ‘‘goza’’ are widely used terms in many Arab countries such as Egypt, Kuwait, Bahrain, Qatar, Oman, UAE, Saudi Arabia, Morocco, Tunisia, Somalia and Yemen. “Nargeela,” or “Argeela” are the widely used terms in Turkey, Greece, Cyprus, Armenia, Azerbaijan, Lebanon, Iraq, Jordan, Israel and Syria as well as many Arab Mediterranean countries. It is also known as “Hookah” in the Indian region (5).

Shisha smoking has been a common practice for more than three centuries (7). Two centuries ago, shisha smoking was especially prevalent and was considered a very stylish practice among the elite of both sexes. Over time shisha smoking decreased as smokers began to replace it with cigarette smoking (37). However, in recent years, shisha smoking has once again regained popularity (37). Shisha first originated in India. The original shisha was made of a coconut shell with a straw placed into the emptied coconut in order to inhale substances they would then place inside the hollowed coconut (38). Years later, in parallel to the introduction of tobacco to the Arab region, this newly invented method was somewhat capable of spreading in this area, where it was enhanced to accommodate the possibility of inhaling tobacco (38). In Egypt, the gourd was a replacement for the coconut shell (39). Later, in the Persian peninsula, some parts were substituted in order to attain the more enhanced shape that is closer to the one used nowadays. For example, Persians exchanged the hard stiff straw with an elastic hose, which added more flexibility and satisfaction. A bowl and plate, which were also added to the top of the shisha, acted as a tobacco holder and charcoal burner (38). From there, shisha in this form spread to reach other parts of the Middle East where each country modified the design slightly, resulting in the current forms and shapes of water-pipes (37,38).

The types and amount of tobacco used vary greatly. One of the most common types of tobacco used is “Mu'essel” or “maasel.” The other kinds of tobacco used are the “Tumbak,” or “Jurak” (4). Some smokers use additives in the water, such as pomegranate or any other fruit juice including coconut, vanilla, rose oil, or mint leaves to improve the flavor, however this practice has only been developed in the last 20 years (36,37).

2.4 Harmful Constituents of Shisha Smoking and Adverse Health Effects

Scientific research has shown that shisha smoke is composed of toxicants and harmful constituents in quantities similar to or even higher than cigarettes (5). Shisha smoke contains nicotine, carbon monoxide, tar, heavy metals such as cobalt, arsenic, chromium, and lead, and other carcinogens (5). The adverse health effects caused by shisha smoking depend on various determinants. Health risks are affected by the amount and type of tobacco used, the charcoal brand, the combustion temperature, the size of the shisha device, the length and number of smoking sessions, and the amount of the smoke inhaled (5,21).

Smokers consider shisha smoking to be less harmful and less addictive practice than smoking cigarettes (40). This misconception could be due to the presence of water, with people believing that it filters the harmful materials present in tobacco (6), however, research has demonstrated that this is not the case (40). Although Shafagoh and Mohammed (2002) found that the water in shisha traps about 5.0% of the nicotine released during shisha smoking, Shihadeh (2003) reported that more than 2.0 mg of it are lodged in the mouthpiece (40).

A considerable number of studies have reported that shisha smoking is at least as toxic as cigarette smoking, if not more so (7). In general, occasional shisha

smokers, in a normal session that lasts between 15-90 minutes, using one “hagar,” are exposed to same amount of nicotine as that produced from smoking two cigarettes, while the amount of nicotine for regular smokers who smoke between 2-3 sessions/day is equivalent to smoking a pack of cigarettes over 24 hours (3). Neergaard et al.(2007) stated that the nicotine released during an entire session of shisha smoking for non-daily users corresponds to the nicotine inhaled from smoking two cigarettes, while for daily users it is equivalent to smoking 10 cigarettes (41). This set of findings is similar to the findings from Benowitz et al. (1983), which demonstrated that one shisha smoking session exceeds the amount of nicotine yielded from the 0.88 mg of a typical U.S. cigarette (42).

In addition, Benowitz et al. (1983) found a 24-hr urinary cotinine level of 0.785 mg/ml among those who smoke shisha on a daily basis with 1- 10 puffs/ day, is produced, which corresponds to the amount absorbed from smoking 10 cigarettes. The urinary cotinine level over 4-days for those who sporadically smoke shisha, however matched the amount of nicotine absorbed from smoking two cigarettes per/day (42). Other research found that during a normal shisha smoking session ranging between 40 to 50 minutes, smokers are exposed to 40 times the amount of tar, 10 times the amount of carbon monoxide, double the amount of nicotine, and 30 times the carcinogenic hydrocarbons released when smoking one cigarette (43,44). Shihadeh and Saleh (2005) estimated that the amount of nicotine released in a single shisha smoking session is 2.94mg while the amount of tar and Co are 802 mg and 145 mg respectively (45). Moreover, studies have shown that shisha smoking releases higher amounts of heavy metals such as arsenic, cobalt, chromium, and lead compared to cigarette smoking, and is capable of satisfying the nicotine craving of those dependent on tobacco use (43,46, 47).

Even though research studies on the adverse health effects of shisha smoking are limited, the fact that shisha smoking causes adverse health effects is undeniable. The extent of these health hazards is what requires further investigation (34). In general, health risks caused by shisha smoking are not expected to be dramatically different from those caused by cigarette smoking. For example, Maziak et al. (2004) posited that shisha could be responsible for cardiovascular health hazards and lung diseases similar to those caused by cigarette smoking because the amount of carbon monoxide released during cigarette and shisha smoking is the same (5). Another study found that compared to non-smokers, those who smoke shisha on a daily basis have high levels of carcinoembryonic antigen (CEA), which is a precursor to tumor development (44). In addition, Al Rashidi et al. (2008) found that shisha smokers during a regular shisha session are exposed to 630 μg of formaldehyde and 2520 μg of acetaldehyde, which are equivalent to 17 cigarettes with respect to formaldehyde, and five cigarettes with respect to acetaldehyde. These amounts are considered high and pose health risks to shisha smokers' respiratory system (48).

Scientists further link shisha smoking to health hazards similar to those caused by cigarette smoking, such as several types of malignancies, respiratory tract diseases, palpitation and hypertension, cardiovascular diseases, fertility problems, low-birth-weight infants, and second-hand smoke and its related health risks (40, 41,49, 50). Data obtained from a systematic review of twenty-four studies using the Cochrane Collaboration methodology linked shisha smoking to lung cancer and respiratory tract diseases, as well as mouth and gum diseases. The study also found that pregnant women and infants are vulnerable to shisha risks. Important associations were detected linking shisha smokers to the risks of bladder cancer, nasopharyngeal and oesophageal cancers (51).

Furthermore, data obtained from a meta-analysis of 24 studies associated the prolonged use of shisha to nicotine dependence and a subsequent increase in the likelihood of tobacco related health hazards (52).

Some studies have also correlated the unsanitary practice of sharing shisha between individuals without changing the mouthpiece to be a source of serious infectious diseases such as tuberculosis, hepatitis, and herpes (5).

2.5 Global Trends in Shisha Smoking

Shisha smoking is a traditional method of smoking tobacco products. It is mainly prevalent in the Middle East, Africa (especially the northern countries), and in the South East Asia (53). This traditionally cultural practice has spread to the western world, where it is used mostly among university and high school aged students of both sexes (5, 54).

2.5.1 Prevalence of Shisha Smoking in Eastern Countries

Little data is present on the incidence and prevalence of shisha smoking. Of the limited studies that do exist, most have been conducted in the Middle East. For example, a survey study conducted in two rural communities in Egypt on 6762 male individuals reported that 22.0% of this sample were shisha smokers (55).

In another study of a sample of 635 Egyptian secondary school students, 19.0% of the sample had tried shisha smoking, while of 2355 household individuals of the same age, only 3.0 % reported having tried shisha smoking (56). In a national survey study that was implemented in Kuwait, 57.0% of males and 69.0% of females were reported to be shisha smokers (57). In 2001, among a sample of 1964 university students in Beirut, one third of males and roughly a quarter of the females surveyed

were reported to be weekly shisha smokers, while in 2002, among a sample of newly recruited students in the American University in Beirut, almost half of the sample (43.0%) was reported to be users of shisha (58).

A survey was conducted in five economically depressed areas in Johannesburg, South Africa. The study found that, among a sample of 202 students aged 14-20 years old, 60.0% of the participants were smoking shisha and twenty percent of were regular daily users (59).

In a sample of university students in Syria, around 25.0% of the males and 5.0% of females were shisha smokers (60). Likewise, in a sample of 388 youth in Israel, 22.0% claimed to use shisha on a weekly basis. Another example of the increase in shisha smoking is the increase in retailing Maassel in Bahrain, which has increased by 36.0% in the last 14 years (61).

A school-based nationally-representative survey was conducted over 4 years in Estonia to investigate the prevalence of shisha smoking among youths aged 11, 13, and 15 years old of both genders. The study showed that shisha smoking increased with age: 10.0% of boys and 2.9% of girls were shisha smokers among 11-year olds. Among those aged 13-years old, 25.1% of boys and 13.3% of girls were shisha smokers,while 38.1% boys and 31.4% girls aged 15 were shisha smokers (62).

2.5.2 Prevalence of Shisha Smoking in Western Countries

Although studies on shisha smoking in western countries are especially limited, preliminary studies conducted in developed countries found that the majority of shisha smokers were young people, mainly university students (6,19) . One of the studies that exists was conducted on students attending cafés in Birmingham, England, and

Toronto, Canada; the study reported a widespread tendency of shisha smoking among those English and Canadian students (6). Another study conducted in a British university found that water pipe smoking on a regular basis among university students ranges between 8.0-15.0 %. (19). Another Canadian study found that 23.0% of a sample of 871 youth aged 18-24 years had smoked shisha in the past year and that 5.0% had used shisha in the past month (21).

A 2006 Canadian survey showed that shisha smoking is also prevalent among adolescents, with 7% of students in grades 7 through 12 reporting shisha use (63). The Canadian Tobacco Use Monitoring Survey (CTUMS), 2011 reported that 12% of Canadian youth aged 15-19 years had tried smoking shisha (22).In a study conducted in the USA, the percentage of shisha smoking in the last month among college students was as high as 20.0% (20). Those numbers indicate that shisha smoking is becoming common form of tobacco smoking among young people.

As shisha smoking is becoming a popular method of tobacco smoking among young adults, many establishments selling shisha are now open in western countries mainly around universities. For example, in 2004 in the United States between 200-300 new shisha cafes started their business with a strategic location around university campuses. Convenience surveys were conducted in John Hopkins and Virginia Commonwealth Universities, 15.3% and 20.3% of university students respectively reported smoking shisha in the past month (64). In Montreal, Canada , there are around 150 shisha lounges where smoking shisha is advertised and sold even to minors (65).

A 2012 study in the United States determined that shisha establishments are reaching young people through online advertising. Through analyzing 144

establishments' websites, the authors discovered that those establishments promote their business as a friendly, fun place where people can visit with no mention of tobacco ingredients, health warnings, or age limit restrictions(44).

2.6 Perception of Shisha Smoking

The increasing prevalence of shisha smoking, especially among younger population, may be partly due to a perceived positive image that shisha smokers are sociable (5) and more appealing (10). Indeed, evidence suggests that social norms have made shisha smoking more popular and more acceptable for females to use. In a Syrian study investigating attitudes toward shisha smoking among different genders, a positive attitude toward shisha smoking, specifically among the female group participants, who perceived smoking shisha as an appealing habit was found (10). However, the rate of shisha smoking is still higher among males (66). A qualitative study conducted in Lebanon, Egypt, Palestine, and Syria addressed the main reasons behind this difference. The study found that, even though females shisha smoking was perceived by females as a form of liberation from the superiority of males in their society, the Middle-Eastern countries remained very conservative with respect to shisha smoking among females. Female use was generally perceived mostly as disrespectful, ill-mannered, and associated with liberal sexuality (67).

Factors that may account for the rising use of shisha include the widespread availability of the product and social norms around the acceptability of shisha use. . The number of shisha bars are increasing worldwide and their presence re-enforce acceptability of shisha. Shisha smoking appears to be increasing particularly among younger age groups, due to a greater amount of spare time and disposable money, both of which have been associated with greater likelihood of use (11). Diverse

marketing techniques may also be increasing prevalence, including marketing associated with different festive decorations on shisha equipment, different portable sizes of shisha, and appealing flavours, which make shisha smoking easier to use and more appealing (68, 69,70)

Similar results were found from a qualitative study that was conducted in two areas in Lebanon (an urban and a rural area) to examine participants' perceptions of the reasons causing the increase in shisha smoking in Lebanon. The study conducted 25 focus groups and nine in-depth interviews; including diverse groups of shisha smokers and non-smokers of different age groups 18-65+ years old of both genders with different educational levels and employment status. Findings from this study showed that the main identified reasons of the rise in shisha smoking are the accessibility of shisha to users, being reasonably priced in comparison to cigarettes, the attractive decorations on shisha equipment, and the unique aroma of the shisha products. Other reasons are rooted in media stimulation of shisha smoking and the lack of distinctive tobacco policies directed towards impeding shisha smoking (70).

There is also a prevalent misconception that shisha smoking is less addictive than cigarette smoking (6). The difficulty in associating shisha smoking with nicotine dependence gives smokers the false impression that they are able to quit shisha smoking anytime without undergoing nicotine dependence symptoms. However, this impression is far from the reality. A study examining the pattern of shisha use among beginning and established smokers concluded that about 66.0% of study participants found it very difficult to quit shisha smoking due to nicotine dependence (60). In addition, further studies revealed that one of the troubles confronting shisha smokers

was that nicotine dependence can occur even with low levels of utilization (61,71, 72).

Another common misconception regarding shisha is that it is less harmful than cigarette smoking (6). Several studies have addressed shisha smokers' perceived attitudes toward the relative harm of shisha smoking and found mixed perceptions. For example, 90.0% of the school children who participated in an Israeli study reported believing that shisha smoking is a risk to health (71), while in a Syrian study one third of the sample asserted their belief that shisha smoking is less harmful than cigarettes (74). In an Egyptian study, one fifth of the sample believed that shisha smoking is less harmful to human health than cigarettes, while the other 80.0% were aware of the adverse health effects caused by shisha smoking (55).

It is worth noting that 40.0% of the global population resides in countries where false and misleading beliefs about tobacco use are prevalent(75).In light of the lack of health knowledge surrounding shisha smoking, there is a critical need to implement policies that effectively communicate the health effects of shisha-smoking.

2.7 Tobacco Control Policies and MPOWER

Tobacco smoking is accountable for an excessive number of diseases and deaths worldwide that would be easily avoidable through the control of tobacco demand and consumption.

The World Health Organization (WHO) is helping countries fight tobacco use and limit the appeal of tobacco promotions (24, 75). In May 2003, the World Health Organization approved the WHO Framework Convention on Tobacco Control (FCTC), which is one of the United Nation's most widely adopted agreements. This

document is the first global health settlement discussed under the support of, and sponsorship from, the WHO. It intended to decrease avoidable tobacco-related health risks and their consequent deaths globally. The FCTC provides comprehensive guidelines that direct inclusive and effective tobacco control strategies (76).

The WHO inaugurated a package composed of six important tobacco control regulations referred to as MPOWER, which includes warnings about the risks of tobacco use (75). Shisha smoking has not yet been integrated under these comprehensive tobacco control strategies. The WHO's Study Group on Tobacco Product Regulation (TobReg) demands the expansion of the legislation directed toward the control of cigarette smoking suggested by the FCTC to include shisha smoking (1).

2.8 Tobacco Warning Labels

Regardless of the evidence on the risk of tobacco use, a relatively low percentage of tobacco smokers comprehend health threats that tobacco use poses to them (77) Tobacco graphic warning labels discourage and combat tobacco smoking.

2.8.1 Public Health Rationale

Health warnings are statements, product information inserts, or advertisements that warn consumers that a product may have a harmful impact on their health or on the health of others (78). Therefore, tobacco-warning labels should increase consumers' knowledge of the harmful effects of the tobacco product.

There is a significant gap in smokers' understanding of the hazardous health risks of smoking despite the public availability of this knowledge for over 25 years. Hammond et al. (2006) illustrated that slightly less than three-quarters of smokers (73.0%) were aware that smoking can cause strokes, while less than half of smokers

thought that smoking caused impotence (41.3%). Smokers' knowledge of the toxic constituents in cigarette smoke was also lacking (79). Therefore, increasing awareness on the harmful health effects of smoking is necessary. Exposing smokers to such knowledge plays a key role in motivating them to quit.

The FCTC states as its guiding principle that, "Every person should be informed of the health consequences, addictive nature and mortal threat posed by tobacco consumption and exposure to tobacco smoke." (75) Health warning labels can be considered a sustainable means of providing information and knowledge to smokers about the hazardous health risks associated with smoking.

Warning labels on cigarette packages appear to be an ideal medium for transmitting messages regarding these risks. Health warning labels on cigarette packs deliver their messages to the target audience, smokers, and those who are interested in smoking, and can be expected to expose these groups to the health warning messages frequently. For example, someone who smokes a pack a day will be subjected to warnings 20 times per day, 7300 times a year (78, 79, 80). Therefore, health-warning labels represent an important strategy to communicate the economic and health burden of tobacco use.

2.8.2 Impact of Tobacco Health Warning Labels on Tobacco Consumption

2.8.2.1 Evidence from Developed Countries

Warning labels are an effective and cost efficient way of delivering and promoting smoking-related knowledge to consumers, which motivates smokers to quit. The impact of health warning labels differs according to their presentation. Research indicates that rotating, large, colorful, prominent, and clear graphic imagery

has the most effective impact as it forces people to notice anti-smoking or smoking cessation information.

When the health warning labels on cigarette packages were first imposed in Canada in December (2000), these warnings established an international model and example for their design. The Canadian warnings occupied 50.0% of the front and back of cigarette package. This size established that, in general, implementing tobacco package warnings could be considered an effective public health approach. This is because of the fact that tobacco companies cover the expenses of printing them, not the government (75). Moreover, these warning labels are considered an important basic action toward national health education (78).

There is much empirical evidence from developed countries and a number of developing countries that cigarette warning labels can play an important role in motivating the intention to quit smoking. For example, one study that investigated the influence of Canadian cigarette warning labels on current adult smokers found that 91.0% of the 616 sampled adult smokers from South-Western Ontario, Canada reported some level of cognitive processing of the warnings. Furthermore, a significant positive association was demonstrated between the "cognitive processing" indicators; that is the smokers' degree of awareness, perception, and corresponding discussion regarding the newly implemented warning labels and their potential to influence cessation. With regards to the quit attempts, after a three months follow-up period, the authors illustrated that smokers who had experienced a high level of cognitive processing indicators had relatively higher intentions to process the quitting behaviour; i.e. to quit, to increase the desire and attempts to quit, or to decrease the amount of cigarettes consumed (80).

Hammond et al. (2006) assessed the disparity in smokers' knowledge of the health effects of tobacco smoking as well as the effect of warning labels on cigarette packages on such knowledge in a sample of adult smokers from the US, the UK, Canada, and Australia. This study indicates that health warning labels on cigarette packages are a major source of knowledge of smoking-health risks. Health knowledge was also found to be significantly associated with the potential to stop smoking among smokers in the four countries at both the individual and national levels. Therefore, findings from this study support the importance of health warnings, which serve as a significant source of motivation to quit smoking (79).

A review study by Strahan et al. (2002) suggests that tobacco warning labels should be designed in a way that would attract people's attention to overcome the "wear-out" problem. That is designing warning labels in various colours, broadening their content, and producing variety of warning labels are ways to attract attention and reduce warning label overexposure, and to increase the likelihood that people will read them and be influenced to quit (81).

Hammond and his colleagues (2004) assessed the effect of the newly introduced Canadian warnings on cigarette packages. The study concluded that Canada's health warning labels on cigarette packages operate as a successful public health intervention policy. Nineteen percent of sampled smokers stated a reduction in their smoking status due to the introduction of warning labels, whereas only1.0% maintained or increased their smoking habit. The study found that smokers reported a range of negative emotions at 3-month follow-up, including disgust (58.0%) and fear (44.0%). The study illustrated that smokers who experienced such emotional reactions are more likely to quit smoking, attempt quitting, or reduce the quantity of cigarettes smoked.

About one-third of the participants tended to avoid the health warning labels; however it was shown that the effect of health warnings on their quitting attempts was comparable to the other participants (82).

In another study, Hammond et al. (2004) assessed the impact of the newly implemented graphic warning labels on Canadian cigarette packages in Waterloo, Ontario on intentions to quit smoking among ex-smokers. The study also found that graphic warnings were associated with an increase in cessation behaviour. Overall, 31.0% of the former smokers surveyed felt that warning labels stimulated them to quit, and 27.0% believed that warning labels helped them to stay abstinent from smoking. The findings represent strong support of the positive impact of health warning labels introduced in Canada on cigarette packages on encouraging quitting among smokers (83).

One quasi-experimental study focused on examining the health warnings that were introduced and enhanced in the US, the UK, Canada, and Australia to correspond to the FCTC requirements (84).The findings indicated that smokers evaluated the vivid warning labels that cover a bigger display area on cigarette packages as the most influential and effective. The findings also illustrated that these changes have succeeded in delivering health risk messages to a wide range of consumers. The authors declared that Canada had the most effective warning labels among the four studied countries; even with the changes made to improve the warning labels in the UK, consumers in Canada continued to report higher levels of awareness and knowledge. US warning labels were the least effective, and also have less than the minimum international FCTC requirements for health warning labels. Therefore, improved warning labels that are rotating and clear graphic images are more

sustainable over time than their text-only counterparts, to which smokers adjust more quickly (thus they lose their effect) (84). Similarly, in an examination of the impact of knowledge delivered through small text-based labels on the attitude of adolescent smokers, a longitudinal study found that a considerable number of adolescent smokers did not see or remember the labels, and that awareness of the labels was not associated with reduced smoking (85).

A school-based survey study conducted in Australia with students in grades 8 to 12 evaluated the effect of the newly introduced health warning labels on cigarette packs in graphic format on the attitude of adolescents to smoking. Unlike the previous study, the researchers found that graphic warning labels on cigarette packages were recalled by most of the adolescents, encouraged adolescents' "cognitive processing" of the health warning messages, and reduced smoking. Therefore, imposing graphic warning labels on cigarette packages may play an important role in reducing smoking initiation among adolescents (86).

Another study conducted in Australia demonstrated that the introduction of the enhanced graphic warning labels resulted in a 29.0% increase in the rate of people who "sometimes" observed the warning labels (to 66% from 37% at a 6 month follow-up), and a 7.0% increase in people who quit smoking due to the presence of health warning labels (87).

A review study conducted by Hammond (2011) found that graphic and enhanced text warnings dramatically increased smokers' perception of harm and health risks associated with smoking in several studies across the world (88). O'Hegarty and colleagues (2007) also found that inserting messages related to tobacco

consumers was an effective method to inform smokers of health risks associated with smoking (77).

2.8.2.2 Evidence from Developing Countries

There is limited research from a developing country context on the effect of tobacco warning labels. However, one study conducted in Mexico assessed the impact of pictorial health warning labels on cigarette packages on the reduction in cigarette demand among adult smokers, compared to text-only warning messages. The price auction method was conducted on a purposive selection sample of 89 adult Mexican smokers, in which adult smokers set an offer on both types of cigarette packs. Results indicated that adult smokers in Mexico tended to place a relatively lower bid on graphic warning label on cigarette packages in contrast to their text-only counterparts. This signifies that the imagery warning labels are effective in reducing cigarette consumption relative to the text-only messages. It is worth noting that the lower value of imagery warnings labels was consistent among different socio-demographic sub-groups (89).

Additionally, a study conducted in Brazil examined the impact of recently initiated graphic health warnings through a reliable psychometric tool. Two series of graphic warning labels, along with a control pictures, were randomly presented to a sample of 212 undergraduate students in order to evaluate the “emotional” effect of the images. Results indicated that except for those warnings depicting people smoking, smokers and non-smokers reported similar levels of perceived effectiveness. Results also suggested that for warning labels to be effective, they should include displeasing pictures (90).

A population-based comparison study, derived from the ITC project, of a representative sample of 1,751 adult smokers in Canada and 1,081 adult smokers Mexico compared the impact of the Canadian graphic warning labels versus the Mexican text-only counterparts. The Mexican sample was obtained using a two-phase stratified random sampling technique from four urban cities there. The study reported that Canadian smokers had higher recall and awareness of the health warning label messages and consequently higher likelihood of quitting smoking than Mexican smokers. Moreover, due to the more detailed information regarding the hazardous effects of smoking on health imposed on the Canadian warning, Canadians showed higher awareness of smoking related health risks. Lastly, the study found that most of the Mexican smokers wanted more health-oriented knowledge to be included on their warning labels in the near future. This study indicated the presence of a stronger positive association between the graphic warning labels, compared to text-only messages, and intention to quit (91).

On a representative sample of 2,006 Malaysian adult smokers, a survey study was conducted using face-to face interviews to assess the different reactions of exposure to health warning labels on cigarette packages, as well as their relation to quitting intentions. The authors studied the different variables related to warning salience and quitting intention using a standardized questionnaire. The study illustrated that distributing knowledge about smoking health risks using strong yet not severe warning labels messages is predicted to be an effective method. However continued recalling, noticing, and discussing the warning labels (processes which when combined are known as "cognitive processing" (83), together with the ability to quit smoking, are considered highly significant tools to motivate the intention to quit and even promote the smokers' belief in achieving success in stopping smoking.

Moreover, compared to high-income countries, Malaysian smokers reacted as effectively to warning labels in terms of beliefs and quit intentions (92).

A cross-sectional survey study was conducted on a convenience sample of 450 participants aged 17-26 years old in Jordan. This study sought to evaluate the impact of four newly introduced graphic warning labels on cigarette packages on smokers and non-smokers' perceptions and emotional reactions in comparison to those warnings being used within the country. The findings proposed that although the new graphics may have triggered some perceptions of salience and unfavourable affective reactions, especially among smokers, the the effect was not sufficient to elicit behavioural changes. Graphic messages should be diverse to reach different types of audience (93).

Overall, research indicates that warnings, particularly those with graphic pictures, increase the smokers' awareness of the negative health effects of smoking, motivate smokers to quit, and increase their odds of remaining smoke-free.There is significant evidence of the impact of health warning labels to educate consumers on smoking-related health knowledge and to promote smoking cessation. Moreover, smokers in developing countries tend to respond to warning labels in ways comparable to those from developed countries. It was also concluded that the impact of graphic imagery warning labels is more effective than text-only messages in promoting smoking-related knowledge and quitting behaviour.

2.9 Warning Labels and Shisha Consumption

Despite the success of warning labels on cigarettes,only one study has been conducted to assess health warning lables on parts of shisha (filters, mouthpieces, aluminum foil, and charcol) and tobacco packs used in shisha (mo'assel and/or

Ajami). Nakkash and her colleague (2010) found that all the tobacco packs used with shisha examined from different countries (Lebannon, Bahrain, Jordan, Syria, Palastine,South Africa, Canada, and Germany) did not meet the FCTC standards for health warnings. Warning labels were found only on side of the pack, however all the other examined parts, except in Canada, Germany, and Palestine, had deceptive descriptions (94).

Currently, little to nothing is known about the potential impact health warning labels may have on shisha users. The current research will assess the potential impact of health warnings on the perceptions, attitudes, and smoking behaviours among shisha users.

3.0 STUDY RATIONALE AND RESEARCH QUESTIONS

3.1 Rationale

While there is considerable evidence on the effectiveness of health warning labels on cigarette packages in enhancing perceptions of risk, motivating smokers' intentions to quit, and promoting cessation (6,17,18,19,20,21,23,24,25,26,27), there is limited evidence examining the impact of warning labels on shisha consumers' perception of risk, intentions to quit , and in changing patterns of shisha smoking.

The introduction of health warnings on cigarette packages has been shown to be a very effective and inexpensive way to reduce tobacco use. Therefore, investigating the effectiveness of a similar approach with shisha products is critical to controlling shisha use.

Overall, this study intends to expand the evidence base regarding the potential impact of warning labels on the perceptions of and attitudes toward shisha smoking. Results of this study will provide information on the potential effect of warning labels on shisha smokers' perception of harm and intentions to quit, which may contribute to informing and establishing policies and priority actions appropriate for the prevention of shisha smoking.

The objectives of this study were:

1. To examine the impact of viewing health warning labels on perceived susceptibility and severity of shisha smoking health hazards, on motivating intention to quit, and on changing the pattern of shisha smoking.
2. To evaluate the efficacy of text- only versus graphic warning labels on shisha smoking.

2.2 Research Questions

1. Do perceptions of effectiveness differ for text-only versus graphic shisha health warnings?

2. Do perceptions of effectiveness for shisha health warnings differ by age, sex, education level, socioeconomic status, frequency of shisha smoking, ethnicity, and health status?

3a. Does viewing health warning labels have an impact on shisha smokers' pattern of use and behaviour?

3b. Does viewing health warning labels have an impact on shisha smokers' knowledge, health beliefs, and attitudes, and perceptions of harm?

3c. Does viewing health warning labels have an impact on shisha smokers' intention to quit and quit attempts?

4.Which form of warning labels (Text-only or Graphic warning labels) will have the greatest impact on changing the pattern of use, knowledge, health beliefs, perceptions of harm and intentions to quit?

4.0 METHODS

4.1 Design Overview

A double-blinded randomized control trial using an online survey was conducted in Ontario, Canada between June-October, 2011. A convenience sample of 413 current shisha smokers, 18 years of age and older, and can read English, was recruited. Participants completed a pre-intervention online survey, viewed six health warning labels and rated them in the same setting. Two weeks later, participants were invited to complete an online follow-up survey. Eighty-three percent of the sample completed the follow-up survey (342 out of the 413 participnats) from baseline were able to complete the follow-up survey. Particpants received a Tim Horton's $10 gift card as a remuneration following each completed survey ($20 in total).

4.2 Study Protocol

4.2.1 Survey Development

Programming of the online survey took place at the University of Waterloo in June, 2011, and was uploaded to the Survey Research Centre (SRC) server in June 18, 2011. The survey was pilot tested with 5 people in order to test any problem(s) with the server and/or the questionnaire. The data collected from the pilot surveys was not included in the results.

4.2.2 Recruitment & Remuneration

4.2.2.1 Recruitment procedures

Recruitment of potential participants started in June 20th, 2011 and the first online link was sent on June 23rd, 2011. Recruitment of participants for the online study took place in different locations in Ontario, Canada. Participants were

familiarized with the study through distributed flyers and posted e-mail invitations to different locations in Kitchener-Waterloo, Guelph, and Toronto, Ontario, Canada.

4.2.2.2 Recruitment settings and location of the study

Flyers were posted on bulletin boards in the Davis Center and the Dana Porter library at the University of Waterloo, Columbia lake field, Waterloo, two Arabic and one Chinese grocery stores in Waterloo and to the Multi-Cultural Center Waterloo (an e-mail was also sent to their members list). Flyers were also posted in one Arabic grocery store in Mississauga.

Permission was sought from owners of cafés in Waterloo, Cambridge, and Toronto to post flyers in their cafés. Unfortunately, the owners did not grant approval as they felt it would be bad for business.

Classified advertisments were posted in the University of Waterloo newspaper, 'Imprint', and on the University of Waterloo website, 'The Daily Bulletin.' Advertisments were also posted on the following websites: "Kijiji", "e-classified 4 U" and "Addos.com" in Kitchener and Toronto. Contact was also made with community adminstrators of membership-based communities to send e-mail invitation to every member on their list serv. For example, email invitations were sent to the members in Turkish, Pakistani, Egyptian, Iranian, and Saudi, and Asian communities in Waterloo, Guelph and Toronto.

Invitations to the study were also sent to the graduate students' list at the University of Waterloo, York University, and Guelph University. The invitation was also sent to the undergraduate students' list at the University of Waterloo. Advertisement and invitation are available in Appendix (A).

Contact information (e-mail) of the researcher was provided on the distributed flyers, classified ads. and e-mail invitations. Interested participants made contact with the researcher via e-mail. Upon contact, the researcher provided the interested person with a very brief description of the study, information regarding the remuneration ($10 Tim Horton's gift card after each survey), and eligibility requirements. The interested participants then received the link, personalized with unique id and password specific for each participant, to the online survey to prevent multiple submissions using the same e-mail account.

This randomized control trial was an online study and all the data was automatically uploaded to the Survey Research Centre (SRC) server at the University of Waterloo, Ontario, Canada.

4.2.2.3 Ethics and Funding

The current study was funded by the Ontario Tobacco Research Unit (OTRU). The study was reviewed and received ethics clearance through the Office of Research Ethics, University of Waterloo.

4.2.2.4 Remuneration

At the end of each survey, participants received $10 CAD gift card to Tim Horton's coffee shop after each survey (baseline and follow-up).

4.2.3 Data Collection Procedures

4.2.3.1 Screener & Eligibility Criteria

Participants who logged in to online survey using the provided link were first screened through three questions regarding their shisha smoking status, ability to read English, and their age.

Only those who were identified as 18 years of age and older, were able to read English, and identified as shisha smoker were eligible to participate. “Shisha smoker” was defined as either “current shisha user” (having smoked one or more shisha within the past 2 weeks) or “regular user” (having smoked one or more shisha per day for the last 2 weeks) (31).

4.2.3.2 Data collection overview

Eligible participants first completed an online baseline questionnaire, and were then randomly assigned to one of three conditions:a control condition, in which they viewed nutrition labels (Condition 1), or one of two experimental groups in which they viewed text- only messages (Condition 2), or they viewed a combination of graphic and text messages (Condition 3). In each of these three conditions, participants viewed six health warning labels and rated them using likert scale questions immediately following each label. Two weeks later, participants were invited to complete the online follow-up questionnaire to assess the potential changes in attitudes and behaviours toward shisha smoking.In total, of the 413 participants who completed the first online survey, only 342 completed the follow-up survey.

4.2.3.3 Baseline Demographic Data and Informed Consent

Eligible participants were asked to sign an informed consent letter prior to baseline data collection. The information letter included information about the study and its purpose; it clarified the extent of obligation required from participants toward the follow-up and the option to decide to withdraw from this study at any time without any negative consequences. Mailing and e-mail addresses were collected to send a reminder to participants of the follow-up portion of the study.

After signing the written consent, eligible participants were randomly allocated to either the control group or one of the experimental groups.

Participants started the baseline data collection by completing online questionnaire of approximately 20 minutes**.** This questionnaire collected socio-demographic data including age, sex, marital status, ethnicity, level of education, socio-economic status (assessed by the current household income), and average monthly spending on shisha smoking. The questionnaire assessed characteristics and behaviour of shisha smoking, such as the starting age of shisha smoking, frequency of shisha smoking, and patterns of shisha smoking, including number of hagar(s) smoked in each session, and the length of each shisha smoking session. In addition, questions regarding knowledge, attitudes and beliefs of shisha smoking such as perceived risk and severity of health hazards caused by shisha smoking, shisha smokers' perception of harm, shisha smokers' attitudes toward intentions to quit and quit attempts were also included.

4.2.3.4 Randomization

Participants were screened for eligibility and those who were identified as being 18 years of age or older at the time of the study, could read English and smoked shisha in the last two weeks prior to the study were eligible for the study. Participants were first asked to complete a baseline questionnaire. Participants were randomized assigned prior to beginning the survey to view either Graphic Nutrition warnings, Text-only shisha warnings, or Graphic shisha warnings. The randomization was blinded to both the researcher and the participants and was concealed until interventions were assigned.

4.2.3.5 Intervention

After completing the baseline questionnaire, each participant then viewed six different health labels —one at a time. The warning labels were adopted from health warnings on cigarette packages currently implemented in various countries, such as Canada and Australia. All warning labels are available in Appendix B.

Health warnings in Text-only condition (Condition 2) included six warning messages for the main health effects caused by tobacco smoking: lung cancer, heart disease, stroke, mouth diseases, and eye diseases. The messages included some threatening information, which were meant to arouse fear and /or disgust. Text-only health warnings also included motivational messages to promote knowledge and awareness of tobacco ETS health risk. The Graphic health warnings viewed in Condition 3 included six pictorial warnings supplemented with text messages. The graphic warnings included warnings for the same main health effects caused by tobacco smoking as in Condition 2. The images were composed of graphics (parallel to the text-only messages) and were meant to elicit negative emotions such as fear and

disgust. Participants also viewed health awareness graphic messages of tobacco ETS health risk. Nutritional warnings (the control group ─Condition 1) consisted of six warning messages representing the health risks of an unhealthy nutritional lifestyle. Nutritional messages were presented in both graphic and text format and included heath risk warnings similar to those used for tobacco smoking, such as those depicting eye and heart diseases, and stroke.

In each condition, participants were asked to rate each of the warning labels with regard to appeal, perceived effectiveness, affective reaction, perceived health knowledge risks , the degree of confidence in the credibility of the knowledge presented by these warnings, the degree of believability of the presented knowledge, the relevance of knowledge obtained from each message, the degree of support to health warning labels, and the likelihood of motivation to quit shisha smoking. A scale from 1 to 10 was used, where 1 was do not agree at all and 10 was extremely agree. Viewing and rating of warning labels took about 10-15 minutes to complete.

At the end of the survey, participants completed the socio-demographic questions. Reminders of the follow-up survey were sent to participants both through mail (with the gift card) and through e-mail.

4.2.3.6 Post-Intervention Follow-Up Data

The follow-up survey was conducted after two weeks (14 days) estimated from the first day of data collection. However, due to scheduling conflicts, reminder emails were sent and an additional 8-10 days was allowed after the two weeks (calculated as 14 days+8=22; or 14+10=24) to complete the follow-up survey.

In the follow-up of the study, participants were asked to complete an approximately 20 minutes online questionnaire. They were asked same questions as baseline. For example they were asked questions related to the perceived effectiveness of health warning labels, depth of processing warning labels such as thinking about warning labels and discussing warning labels with others, the effect of warning labels on knowledge, attitudes and beliefs such as perceived risk and severity of health hazards caused by shisha smoking, shisha smokers' attitude and beliefs regarding intention to quit and quit attempts and perception of self-efficacy to quit, and shisha smoking consumption and pattern of use such as, frequency of smoking shisha, duration of smoking shisha sessions, and number of hagar(s) in each session.

At the end of the follow-up, participants received compensation a $10 Tim Horton’s gift card as a token of appreciation for their time.

Upon completion of the follow-up survey, an automatic feedback letter appeared on the screen, which included information on confidentiality of the collected data and informed participants that if interested, they would receive a copy of the study results when available. Information on smoking cessation resources was also provided.

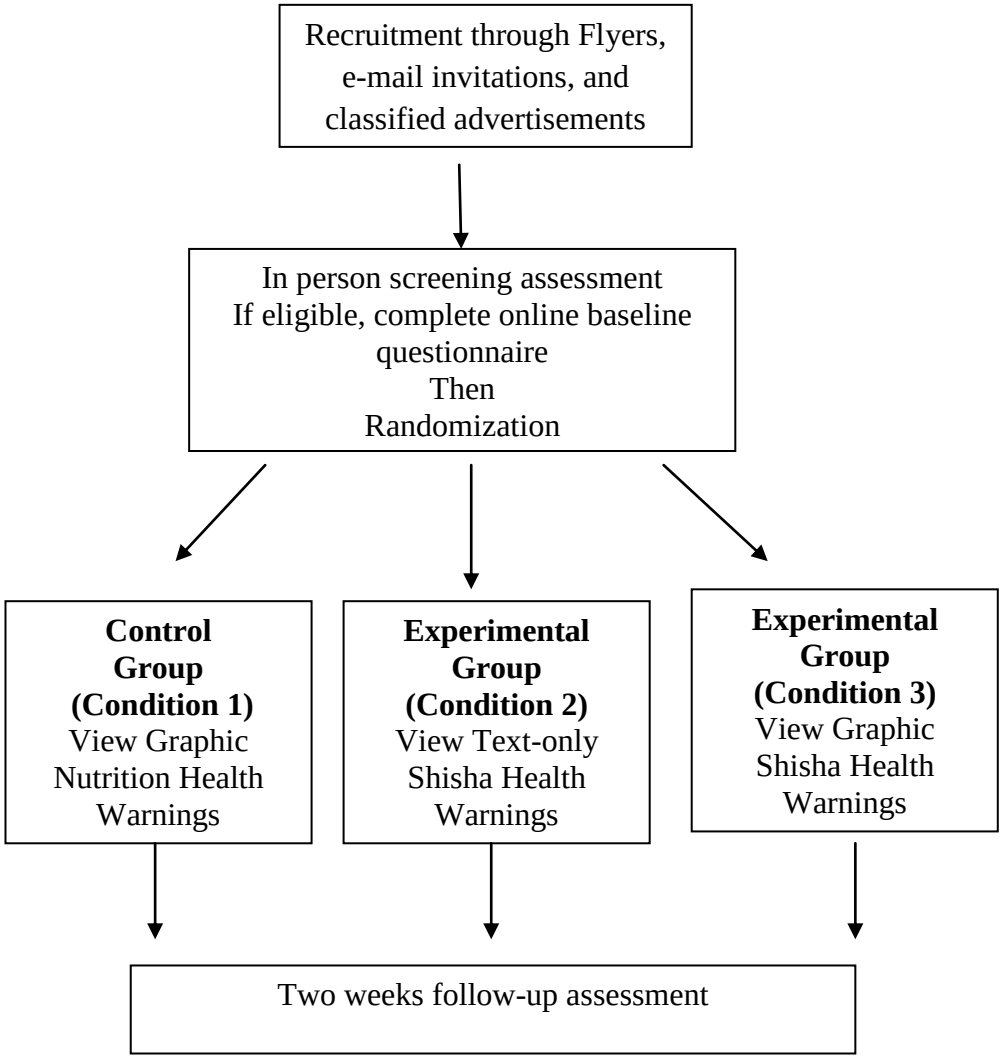


FIGURE 1.1: FLOW CHART OF EXPERIMENTAL STUDY

4.2.3.7 Rational of Data Collection Method

The online format of this survey allowed us to target a large and diverse group at a lower cost compared to face-to face interviews. In addition, the interviewer effect was minimized due to the anonymity and confidentiality of the online survey. For example, participants in online surveys tend to feel more comfortable and relaxed while answering the questions on the computer compared to an obligation of a social interaction with the interviewer in the face-to-face interview (95). This allows for more honest and accurate responses to the questionnaire, especially those concerned

with the consumed amount, money spent on tobacco and quit status. In addition, participants in online surveys tend to spend less time compared to face-to face interviews, which is especially useful considering the length of the baseline of the study. Finally, it is thought that the flexibility and lack of time restriction access to the online survey makes it more appealing, which increases the number of interested participants and reduces the expected number of dropouts.

4.3 Sampling

4.3.1 Sample Size

We anticipated reaching a sample size of 360 of current shisha smokers, 18 years of age or older in the first part of the survey.

The attrition rate was expected to be 40.0%. Therefore, using a sample size of 360 should overcome the attrition problem as a sample size of 72 in each group was anticipated to provide an estimated 80.0% power, which will detect a "medium" effect size equal to one-half the standard deviation of each outcome measure with a margin of error set at 5.0% (96). Therefore, this sample size would enable the detection of any statistically significant differences between the outcomes of the intervention groups and provide sufficient power to detect at least a medium effect size.

Given the lack of historical data using similar measures and protocols, we were unable to provide more accurate estimate of the effect size associated with the various outcomes.

A total of 1,009 individuals responded to advertisements for the study, however, only 413 were eligible to complete the survey. Therefore, the sample size of the first

part of the survey was 413 (Condition 1, *n*=137; Condition 2, *n*=137; Condition 3, *n*=139).

Technical issues with the server lead to an unexplained shuffle of participants' answers who were in condition 1(viewed nutritional warnings) (*n*=18) to answer rating questions related to condition 2, 3(Text-only and Graphic warnings) and vice versa. Therefore, in order to avoid contamination of the study, responses from those 18 individuals were removed from the study. Hence, the final sample size reached was 395 for the baseline survey. Out of those 18, only 14 also completed the follow-up survey and their data were also removed from follow-up results.

Of those who participated in the first part of the survey 342 completed the second part of the survey (Condition 1, *n*=100; Condition 2, *n*=117; Condition 3, *n*=125) for a final attrition rate of 13.4%.

Only participants who completed both baseline and follow-up parts of the study were included in this analysis, resulting in a final sample size of 342.

With this sample size (342) (Condition 1, *n*=100; Condition 2, *n*=117; Condition 3, *n*=125), there will be more than 90% power ($\alpha = 0.05$, 2-sided exact test) to detect a difference of 18% between the study groups.

4.3.2 Missing data and drop-outs

Participants were required to provide answers to all survey questions. In the current study, participants' rate of drop out (from baseline to follow-up) was 13.4%. We only included those who completed both surveys in the study as we did not expect

those who dropped out will lead to a remarkably different results or conclusions given the high rate of those who completed the follow-up survey.

4.4 MEASURES

4.4.1 STUDY MEASURES

4.4.1.1 Screening Measures

All measures used in the questionnaire have been used and validated in previous research studies. Measures were drawn from existing ITC surveys (28), Hammond et al. (2001) (29), and Maziak et al. (2005) (30) and the questionnaires were modified for shisha smokers**.** A full version of the questionnaire is available in Appendix C.

Those who were interested in participating were first asked a few questions to assess their eligibility. The eligibility criteria included being 18 years of age or older, a current shisha smoker, and able to read English. Eligibility criteria were assessed by the following questions: "How old are you?", "Did you smoke any type of shisha (hooka) (water-pipe) in the last two weeks?", and "Can you read English?"

4.4.1.2 Socio-Demographics Measures

Participants specified their age, gender, marital status, average monthly spending on shisha smoking, and ethnicity as either white, black, Asian, European, Middle-Eastern, Mixed, and other. **Ethnicity** was re-coded into four categories White, Asian, Middle Eastern, and other. Participants' **education** was assessed by asking about the highest level of current education [some elementary school or some high school, completed high school, college or university (some or completed), graduate degree].Education was further dichotomized to moderate (high school some or completed) and high (some and completed university and graduate). Economic status

was assessed by **income** and **employment status**. Income was obtained by asking respondents their total annual household income before taxes (Under $10,000, $10,000-$19,999, $20,000-$29,999, $30,000-$39,999, $40,000-$49,999, $50,000-$59,999, $60,000-$69,999, $70,000-$79,999, $80,000-$99,999, $100,000 or above). Income was re-coded into four categories: Low (Under $10,000, $10,000-$19,999, $20,000-$29,999), moderate ($30,000-$44,999, $45,000-$59,999), high ($60,000-$74,999, $75,000-$99,999, $100,000 and over), and not given (don‘t know, refuse). **Employment status** was assessed by asking respondents their current employment status [working full time, working part time, self-employed, unemployed, student, retired]. Employment status was further dichotomized to employed (working full time, working part time, self-employed) and unemployed (unemployed, student, retired).

4.4.1.3 Main Outcome Measures

4.4.1.3.1 Shisha Smoking Pattern

To assess **average time of shisha smoking**, participants were asked “How many times did you smoke shisha in the last two weeks? ” Response options included “less than one week”, “once per week,” “twice per week,” “3-5 time per week,” “almost every day,” and “every day.” Responses were dichotomized into the either: once per week or less and more than once week.

To assess **average number of shisha sessions, participants were asked** “How many sessions did you smoke per day in the last two weeks?” Response options included “less than one session,” “one session,” “twice per week,” “2-3 sessions,” and “more than 3 sessions.” Responses were dichotomized into one session and more, or less than one session.

Average number of hagar was assessed by asking the following "How many hagars did you smoke per session in the last two weeks?" Response options included "less than one hagar," "one hagar," "2-3 hagars," "more than 3 hagars." Responses were dichotomized into the following, more than one hagar, one hagar or less.

A**verage length of session** was assessed by asking "How long did the average session typically last?" Response options included less than "45 min," "45-60 min," "1-3 hours," and "more than 3 hours." Responses were dichotomized into 45 min,or more more and less than 45 min.

4.4.1.3.2 Attitudes, Beliefs, and Knowledge about Shisha Smoking

Several survey questions were designed to determine attitudes/beliefs about shisha smoking, knowledge of adverse health effects of shisha versus cigarette smoking, perceived risk and perceived severity of health hazards caused by shisha smoking, and the harmful and addictive nature of shisha versus cigarette smoking.

Perceived health risks were assessed by asking the degree to which participants agreed with the following statements: "Shisha smoking is dangerous to non-smokers," "There is no medical evidence that shisha is harmful to your health," "Smoking shisha every once in a while does not damage your health," "If you had to do it over again, you would not have started using shisha," and "It is difficult to quit shisha smoking." For each question response options ranged from "agree, neither agree nor disagree, do not agree and cannot say."

Participants' knowledge of health effects was assessed by asking the following questions: "Based on what you know and believe, does smoking cause: 1. lung disease including cancer; 2. heart disease; 3. stroke or blood clots in the brain; 4. gum and

mouth disease including cancer; 5. emphysema; 6. eye diseases and blindness; and 7. lung diseases in non-smokers from breathing the smoke. For each question response options ranged from “yes, no, and cannot say.”

4.4.1.3.3 Perceptions of Harm

To examine participants' perceptions of harm, respondents were asked “What is your overall opinion of shisha.” Response options ranged from “very good, good, neither bad nor good, bad, very bad, and cannot say.” A dichotomous variable [not bad, bad] was created. “Compared to cigarettes, shisha is same or more harmful or less harmful.” Response options ranged from “less harmful to your health than smoking cigarettes, about the same harmful to your health as cigarette smoking, more harmful to your health than cigarette smoking and cannot say.” A dichotomous variable [less harmful, and same, or more harmful] was created. “Did you think of how much you enjoy shisha smoking?” Response options ranged from “never, sometimes, often, and cannot say.” A dichotomous variable [Yes, No] was created

4.4.1.3.4 Perceived Behavioural Control and Quit Intentions

To assess perceived behavioural control and quit intentions, respondents were asked, “Do you consider quitting shisha smoking?”, and “Have you ever stopped smoking shisha before finishing the session because you thought of the harm of smoking?” A dichotomous variable [Yes, No] was created for the categorical responses. “How easy or difficult do you think it might be to permanently quit using shisha?” A dichotomous variable [Easy, difficult] was created for the response options [very easy, somewhat easy, somewhat difficult, and very difficult] for the difficulty to quit shisha question. “Do you intend to quit shisha smoking?” A categorical variable

[Yes, No] was developed for the categories [In the next month, in the next 6 months, more than 6 months from now, and not at all] of the response to the previous question.

4.4.1.4 Rating of Warning Labels

Following baseline data collection, participants were asked to view and rate each of the six warning labels. The rating of the warning labels included mediating variables to determine the impact of health warning labels. These mediating variables are "policy specific mediators" and "general mediators." "*Policy specific mediators*" (33) allow the determination of the salience of warning labels with regard to assessing the depth of processing and thinking about warning labels, while "*General mediators*" (33) determine the effect of warning labels, including believability/credibility of warning labels, affective reaction, and public support. Those variables were assessed using the following questions: "On a scale from 1 to 10 with 1 being 'not at all' and 10 being 'extremely so', please tell me whether warning labels: Grab your attention; are believable; are relevant to you; are alarming; are frightening; are disgusting; are unpleasant to look at?"

To address the effect of warning labels on assessing the depth of processing and thinking about warning labels and on perceived severity of health hazards caused by shisha smoking, respondents were asked the following questions: "On a scale from 1 to 10, with 1 being 'not at all' and 10 being 'extremely so', please tell me whether warning labels: Make people more concerned about the health risk of shisha smoking; "How does the warning labels make you think/feel about shisha smoking?" and "How accurately do you feel the warnings depict the risks to your health?"

To determine the effect of warning labels on the perceived susceptibility, participants were asked whether they believed warning labels, "help prevent young people from shisha smoking," "make shisha smokers want to quit," "make shisha smokers want to smoke now?"

5.0 ANALYSIS

5.1 Statistical Analysis Overview

Analysis of the data took place at the University of Waterloo. Names and any identifying information was kept in a secure file on the student investigator personal computer and replaced with an ID number.

Analyses were conducted using SPSS version 19.0. SAS version 13.0 was used for the GEE model.

5.2 Hypotheses

1. Tobacco warning labels with combined graphic and text messages will result in greater intentions to quit, quit attempts, and a reduction in the frequency of shisha smoking compared to tobacco text-only and nutrition labels.
2. Tobacco text only messages will result in greater intentions to quit, quit attempts, and a reduction in the frequency of shisha smoking compared to nutrition labels.
3. Tobacco warning labels will increase shisha smokers' perception of harm, knowledge, beliefs, and attitude toward shisha smoking compared to nutrition labels.

5.3 Test Assumption of Normal Distribution

First, data was reviewed for any outlier observation or any unusual patterns. Univariate analysis were conducted for all variables to assess missing values, confirm accurate coding, and examine responses.

5.4 Baseline Descriptive Analysis:

At baseline, a preliminary descriptive analyses (means, standard deviation, and frequency) were conducted to examine the distribution of shisha smokers' demographic and covariate variables. This included the following sociodemographic variables: age, gender, education, employment, income, ethnicity, marital status, health status, the age at which shisha smoking started, the average amount of money spent on shisha smoking in the last two weeks, patterns of shisha smoking, perception of harm, smoking knowledge, attitude and beliefs, the perceived behavioural control, and quit intentions.

5.5 Bivariate Analysis

Bivariate analysis was conducted to examine any differences between experimental conditions in the main study. Key measures were demographic variables, perception of harm, attitude/beliefs and knowledge of health effects, and the outcome measures. The outcome measures include the change in the amount of shisha smoked (pattern of shisha use), the intention to quit, and quit attempts.

Only participants who completed both surveys were included in this analysis. Changes between conditions in baseline were tested and changes in responses from baseline to follow-up in the outcome measures were also assessed. Comparison was conducted for each group to see the difference in their outcome variables in relation to the introduction of different warning labels.

Analyses were conducted using the ANOVA (analysis of variance) to test for continuous variables and the Chi-square to test for analysis of categorical variables. Regression models were used to test for differences between experimental conditions at baseline. The model included only the ‘condition’ variable in a linear or logistic

regression, depending on the whether the dependent variable was binary (logistic) or continuous (linear). In this step, the condition variable was entered as a categorical variable to examine comparisons between each of the three experimental conditions.

Regression models were also used to examine the differences in warning labels ratings among different experimental conditions. Separate linear regression models for each continuous variable were conducted including: believability, understandable, relevant, grabs attention, surprising, frightening, disgusting, unpleasant, effective, make people concerned about health risks, prevent young people from smoking, make smokers quit, and make smokers want to smoke. The model was run to compare the differences in responses between conditions in relation to the different warning labels. The rating measures were also combined into an index across all six warning labels of one condition. Comparison of means on this index was performed.

5.6 Multivariate Modeling:

Generalized Estimating Equations (GEE) method (97) was used to examine differences in responses between conditions in the follow-up versus baseline.GEE models were created for the following outcome variables: pattern of use, perceptions of harm, knowledge/ beliefs and attitude, and perceived behavioural control and quit intentions.

GEE models were developed to expand the generalized regression models to accommodate correlated data.

GEE models are used for observations that are independent of one another, whether they are clustered within a group or repeated measurements on the same individuals over time. Therefore, it assesses the trend of the overall group without

relying on the presence of a given individual all the time. As (GEE) extends generalized linear models (GLM) to a regression setting with correlated observations within subjects and since the study uses longitudinal data (repeated measures), GEE methods will help account for the within subject correlation that arises with repeated measures data.

The basic idea is that if this correlation is ignored, we would end up with variance estimates that are too small leading to standard errors that are too small and inflated test statistics, which could lead to erroneous conclusions about results that appear to be significant, but wouldn't be if you recognized the within subject correlation.

GEE models were also conducted to examine differences between each of the three experimental conditions (nutrition, text-only, and graphic), as well as the nutrition vs. shisha warnings (text and graphic conditions combined).

In the GEE models the outcomes were dichotomous, so we used binomial distributions and logit link functions. The p values reported in the tables represent the significance level of the change over time and were derived from the two degrees- of-freedom Wald test.

In the GEE models the predictor variables were "Condition" (categorical), wave and interaction between conditions and waves.

GEE models were also conducted in order to adjust for the predictor variables: age, gender, ethnicity, income, education, health status, shisha smoking status, cigarette smoking status, condition, and wave. However, the pattern of findings for

the “adjusted” and “unadjusted” models was the same. Unless otherwise noted, unadjusted results are shown. .

The Benjamini Hochberg adjustment for multiple comparisons was applied (98). Original P values are shown in the results tables and footnotes indicate whether the p levels were <0.05 after the adjustment.

Regression analysis was used for the research question ”how effective is the warning label?” The list of covariates included were: gender (male, female), education (high school, higher education), shisha smoking status (monthly, weekly, daily, not answered), income (low, moderate, high, refused), ethnicity (White, Asian, Middle Eastern, and others), health (good, not good),cigarette smoking (smoking, not smoking), intention to quit (yes, no), and condition .The condition variable was entered as a categorical variable in which the Condition1 (Nutrition warnings) was the reference group. The strength of association or non-dependence between the variables under investigation were examined at 95% confidence intervals and significance level at $P < 0.05$.

6.0 RESULTS

6.1. Sociodemographic Characteristics

Table 1.1 shows the sample characteristics. The total sample was 342 (condition 1 *n*= 100; condition 2 *n*=117; condition 3 *n*=125). The mean age of the sample was 21.8 years and 60.5% of the total sample were male. Almost three-quarters of the sample (70.0%) smoked shisha at least once in the last two weeks prior to the study and spent an average of $17.5 on shisha smoking per month. About 40.0% of the respondents were Asian and 14.0% were Middle-Eastern. The income distribution was mostly skewed toward low income and 13.0% refused to provide information. More than three-quarters of participants (78.4%) were unemployed or students as well as not a current cigarette smoker. The majority of participants (88.0%) were in the category of higher education (university and graduate degrees).

Descriptive analyses (ANOVA for continuous variables and chi-square tests for categorical variables) were conducted to test for differences across experimental conditions. No significant differences were observed.

Table1.1 Sample characteristics among experimental conditions

Moderators	**Condition 1 Nutrition** (n=100)	**Condition 2 Text** (n=117)	**Condition 3 Graphic warnings** (n=125)	**Overall**
Age (mean-SD)	21.8 (2.9)	22.1(3.8)	21.8(2.4)	21.8(2.9) P=0.419
Starting age of shisha smoking (mean-SD)	17.6(3.1)	17.9 (3.6)	17.1 (4.6)	17.3 (3.9) P=0.274
Amount of money spent on shisha (mean-SD)	18.8 (35.3)	20.0 (46.4)	14.6 (17.9)	17.5 (34.9) P=0.446

Shisha smoking Status				
Monthly	64.0%	72.6%	73.6%	70.5%(241)
Weekly	26.0%	18.8%	19.2%	21.1%(72)
Daily	3.0%	3.4%	3.2%	3.2%(11)
Don't know	7.0%	5.1%	4.0%	5.3%(18)
				P=0.747
Gender				
Male	63.0%	59.8%	59.2%	60.5% (207)
Female	37.0%	40.2%	40.8%	39.5% (135)
				P=0.830
Education				
High school	11.0%	12.8%	12.0%	12.0% (41)
Higher edu (university and graduate)	89.0%	87.2%	88.0%	88.0% (301)
				P=0.919
Employment				
Employed	18.0%	22.2%	24.0%	21.6%(74)
Not employed /students	82.0%	77.8%	76.0%	78.4%(268)
				P=0.545
Income				
Low	47.0%	50.4%	62.4%	53.8% (184)
Moderate	17.0%	17.9%	12.0%	15.5% (53)
High	17.0%	22.2%	14.4%	17.8% (61)
Don't know/Refused	19.0%	9.4%	11.2%	12.9% (44)
				P=0.094
Marital status				
Not married	88.0%	90.6%	93.6%	90.9% (311)
Married/common law	12.0%	9.4%	6.4%	9.1% (31)
				P=0.343
Ethnicity				
White	23.0%	23.1%	22.4%	22.8%(78)
Asian	45.0%	33.3%	40.8%	39.5% (135)
Middle Eastern	11.0%	18.8%	12.0%	14.0%(48)
Other	21.0%	24.8%	24.8%	23.7%(81)
				P=0.504
Currently smoke cigarettes				
Yes	20.2%	22.6%	28.6%	26.0%(89)
No	79.8%	77.4%	71.5%	73.9%(253)
				P=0.169
Overall Health				
Not good	16.0%	8.5%	14.4%	12.9% (44)
Good	84.0%	91.5%	85.6%	87.1% (298)
				P=0.214

* Significant difference at $p < 0.05$; Non-significant difference at $p \geq 0.05$

6.2 Patterns of Shisha Use, Health Beliefs and Knowledge —at Baseline

6.2.1 Patterns of shisha use—at Baseline

Table 2.1 shows patterns of shisha use. Around 40.0% of the participants in each condition reported smoking shisha more than once a week. More than three-quarters of the sample had more than one session of shisha smoking per week, and around 69.0% reported spending more than 45 minutes per session. Seventy-four percent had more than one hagar per week. Overall, there were no significant differences between the three groups regarding their pattern of shisha smoking.

Table 2.1 patterns of current use of shisha among experimental groups—at baseline

	Condition 1 Nutrition (n=100)	**Condition 2 Text** (n=117)	**Condition 3 Graphic warnings** (n=125)	**P value**
Average frequency of shisha smoking in the last 2 weeks				
More than once / week	41.0%	35.9%	37.6%	$X^2 = 0.6$
Once/week	59.0%	64.1%	62.4%	P=0.737
Average Number of sessions				
One session or more	80.0%	74.4%	73.6%	$X^2 = 1.4$
Less than one session	20.0%	25.6%	26.4%	P=0.49
Average number of hagars				
More than one hagar	74.0%	70.1%	68.8%	$X^2 = 0.8$
One hagar or less	26.0%	29.9%	31.2%	P=0.68
Average length of session				
More than 45 min	69.0%	62.4%	68.8%	$X^2 = 1.4$
Less than 45 min	31.0%	37.6%	31.2%	P=0.48

6.2.2 Health Knowledge, Beliefs & Attitude Toward Shisha Use—at Baseline

Table 2.2 shows the knowledge, health beliefs, and attitudes among participants at baseline. Almost half of the participants in each condition did not believe that there is medical evidence suggesting that shisha is harmful, and also believed that occasional shisha smoking would not damage their health. About three-quarters of participants in each condition admitted they would still smoke shisha if they could start over. In addition, more than half of the sample agreed that shisha should include health warning labels. There was a significant difference between the Nutrition warning condition and the Text-only condition; respondents in Text-only condition were more likely to agree with this statement.

About half of shisha users within each condition acknowledged that lung and mouth diseases, including cancer, are linked to shisha smoking. However, more than 90.0% of users within each condition did not know that bladder cancer, Alzheimer, and eye diseases were associated with shisha smoking. Approximately two-thirds of shisha users in each condition did not believe that shisha smoking was associated with strokes, emphysema, and heart disease. No significant differences were found between conditions.

Table 2.2 Health Beliefs, knowledge & Attitude toward shisha use among experimental conditions— at baseline.

	Condition 1 Nutrition (n=100)	**Condition 2 Text** (n=117)	**Condition 3 Graphic warnings** (n=125)	**P value**
Shisha is dangerous to non smokers				
Do not agree	63.0%	58.1%	60.0%	$X^2 = 0.5$
Agree	37.0%	41.9%	40.0%	P=0.763

No medical evidence that shisha is harmful Agree Do not agree	49.0% 51.0%	53.0% 47.0%	46.4% 53.6%	$X^2 = 1.1$ P=0.58
Not flavored shisha is better than flavored Agree Do not agree	44.0% 56.0%	45.3% 54.7%	41.6% 58.4%	$X^2 = 0.3$ P=0.841
Occasional shisha smoking doesn't damage your health Agree Do not agree	54.0% 46.0%	57.3% 42.7%	54.4% 45.6%	$X^2 = 0.3$ P=0.86
If start over, no shisha Do not agree Agree	86.0% 14.0%	82.1% 17.9%	87.2% 12.8%	$X^2 = 1.3$ P=0.5
It is difficult to quit shisha Do not agree Agree	90.0% 10.0%	88.0% 12.0%	86.4% 13.6%	$X^2 = 0.7$ P=0.71
Shisha should include HW labels Do not agree Agree	47.0% 53.0% [a]	33.3% 66.7% [b]	35.2% 64.8% [a b] *	$X^2 = 4.9$ P=0.08
Worried shisha will damage your health Not worried Worried	52.0% 48.0%	41.0% 59.0%	45.6% 454.4%	$X^2 = 2.6$ P=0.26
Does shisha smoking cause lung disease including cancer No Yes	43.0% 57.0%	40.2% 59.8%	41.6% 58.4%	$X^2 = 0.2$ P=0.91
Does shisha smoking cause Heart disease No Yes	67.0% 33.0%	60.7% 39.3%	60.8% 39.2%	$X^2 = 1.2$ P=0.55

Does shisha smoking cause Mouth disease including cancer				
No	46.0%	47.9%	43.2%	$X^2 = 0.5$
Yes	54.0%	52.1%	56.8%	P=0.76
Does shisha smoking cause Stroke and blood clots				
No	73.0%	68.4%	72.0%	$X^2 = 0.6$
Yes	27.0%	31.6%	28.0%	P=0.72
Does shisha smoking cause Emphysema				
No	71.0%	66.7%	64.0%	$X^2 = 1.2$
Yes	29.0%	33.3%	36.0%	P=0.53
Does shisha smoking cause Alzheimer's disease				
No	93.0%	94.4%	93.6%	$X^2 = 0.4$
Yes	7.0%	5.1%	6.4%	P=0.83
Does shisha smoking cause Bladder cancer				
No	90.0%	91.5%	91.2%	$X^2 = 0.1$
Yes	10.0%	8.5%	8.8%	P=0.92
Does shisha smoking cause Lung disease for non-smokers				
No	56.0%	56.9%	56.0%	$X^2 = 0.02$
Yes	44.0%	43.1%	44.0%	P=0.98
Does shisha smoking cause Parkinson's disease				
Yes	47.0%	48.7%	46.4%	$X^2 = 0.13$
No	53.0%	53.1%	53.6%	P=0.93
Does shisha smoking cause Eye disease and blindness				
No	97.0%	95.7%	95.2%	$X^2 = 0.4$
Yes	3.0%	4.3%	4.8%	P=0.78

* Significant difference at $p < 0.05$; Non-significant difference at $p \geq 0.05$

6.2.3 Perceptions of Harm—at Baseline

Table 2.3 shows participants' perception of harm**.** More than three-quarters within each of the three conditions reported that shisha smoking was not bad and considered it as less harmful compared to cigarettes. However, almost half of participants in each condition thought about the harm that shisha smoking causes to their health. No significant differences were found between conditions on any of these questions.

Table 2.3 Perceptions of harm among experimental groups—at baseline

	Condition 1 Nutrition (n=100)	**Condition 2 Text** (n=117)	**Condition 3 Graphic warnings** (n=125)	**P value**
Overall opinion of Shisha				
Not bad	89.0%	87.2%	88.8%	$X^2 = 0.2$
Bad	11.0%	12.8%	11.2%	P=0.89
How good or bad is shisha to your health				
Not bad	41.0%	45.3%	39.2%	$X^2 = 0.9$
Bad	59.0%	54.7%	60.8%	P=0.61
Compared to cigarettes Shisha is				
The same or more harmful	23.0%	23.9%	31.2%	$X^2 = 2.4$
Less harmful	77.0%	76.1%	68.8%	P=0.29
Did you think of how much you enjoy shisha smoking				
Yes	57.0%	54.7%	31.2%	$X^2 = 0.9$
No	43.0%	45.3%	68.8%	P=0.61
Do you think about the harm shisha smoking causes				
No	49.0%	51.3%	53.6%	$X^2 = 0.5$
Yes	51.0%	48.7%	46.4%	P=0.78

6.2.4 Perceived Behavioural Control & Quit Intentions—at Baseline

Table 2.4 shows participants' perceived behavioural control and quit intentions**.** The findings indicate that the majority of participants did not consider or intend to quit shisha smoking. Only a minority of participants attempted to quit shisha smoking within the last two weeks prior to the study or tried to stop before finishing the hagar. Participants in Text- only and Graphic conditions were significantly more likely to report being tempted to smoke but decided not to. Only about a half of those (in both groups) decided not to smoke when they were tempted to do so. In addition, participants in the Nutrition labels condition were more likely to report that it is 'difficult' to permanently quit smoking shisha, compared to those in Text-only and Graphic Conditions.

Table 2.4 Perceived behavioural control & quit intentions among experimental groups- at baseline

	Condition 1 Nutrition (n=100)	**Condition 2 Text** (n=117)	**Condition 3 Graphic warnings** (n=125)	**P value**
Do you consider quitting shisha smoking				
Never	72.0%	61.5%	72.0%	$X^2 = 3.8$
Yes	28.0%	38.5%	28.0%	P=0.14
Do you think about the cost of smoking				
Never	57.0%	57.3%	61.6%	$X^2 = 0.7$
Yes	43.0%	42.7%	38.4%	P=0.72
Do you intend to quit shisha smoking				
No	61.6%	59.0%	62.4%	$X^2 = 0.3$
Yes	38.4%	41.0%	37.6%	P=0.85

Have you ever stopped before finishing the hagar				
No	83.0%	79.5%	86.4%	$X^2 = 2.1$
Yes	17.0%	20.5%	13.6%	P=0.35
Have you made any attempts to stop shisha in last 2 weeks				
No	88.0%	88.9%	89.6%	$X^2 = 0.1$
Yes	12.0%	11.1%	10.4%	P=0.93
Tempted to smoke, but decided not to				
No	90.0%	55.6%	58.4%	$X^2 = 34.8$
Yes	10.0% [a]	44.4% [b]	41.6% [b]	**P<0.001***
How easy or difficult to permanently quit				
Easy	62.0%	85.5%	86.4%	$X^2 = 24.4$
Difficult	38.0% [a]	14.5% [b]	13.6% [b]	**P<0.001***

Different letters between groups = Significant difference (P<0.05); same letters between group means =Non significant difference (P≥0.05)

***** Significant difference after adjusting for multiple comparison using Benjamini Hochberg test

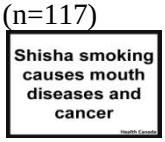
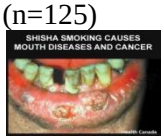
6.3 Health Warning Labels Ratings

6.3.1 Ratings of Mouth Diseases Warnings

After completing the first part of the questionnaire at baseline, participants were randomly assigned to view six health warnings, one at a time, in one of three conditions: Text-only condition, Graphic warnings condition, or Nutritional labels condition.

Table 3.1 shows ratings of mouth disease warnings. Significant differences were observed for 11 of the 15 measures. No significant differences were found for believability, understandability, how warnings make smokers feel about shisha, and how the warning labels depict the risks to health. With respect to pair-wise contrast between text and graphic shisha warnings, graphic warnings had significantly higher ratings for 9 measures, whereas text warning were rated more likely to "make smokers want to quit" and "more relevant" to participants. However, after adjusting for multiple comparisons using the Benjamini Hochberg test, "being relevant to you" became non-significant.

Table 3.1 Labels ratings for "Mouth Disease Warnings"

Mouth Diseases	**Condition 2 Text-only** (n=117)  **Mean (SD)**	**Condition 3 Graphic warnings** (n=125) 	**P value**
Grabs your attention	6.7 (2.3)	8.7(1.9)	**P<0.001***
Is believable	6.8 (2.2)	6.7 (2.6)	P=0.935
Is understandable	7.6 (2.0)	7.6 (2.3)	P=0.900
Is relevant to you	6.0 (2.4)	5.4 (2.9)	**P<0.044**

Is surprising	6.4 (2.6)	7.9 (2.2)	**P<0.001***
Is frightening	6.0 (2.6)	8.7 (2.0)	**P<0.001***
Is disgusting	6.5(2.5)	8.8 (1.8)	**P<0.001***
Is unpleasant	6.6 (2.2)	7.7 (2.2)	**P=0.001***
Concerned about the health risks	5.9 (2.3)	7.0 (2.4)	**P<0.001***
Prevent young people from starting to smoke	5.7 (2.2)	6.7 (2.6)	**P=0.001***
Would make smokers want to quit	3.4 (2.2)	2.6 (2.2)	**P=0.006***
Would make smokers want to smoke	5.4 (2.7)	6.6(2.7)	**P=0.001***
How effective is the warning label	6.4 (2.1)	7.5 (2.1)	**P<0.001***
Warning label make you feel about shisha smoking	4.4 (2.1)	4.2 (2.7)	P=0.519
How accurately the WL depict the risks to health	6.2 (2.1)	6.6 (2.4)	P=0.236

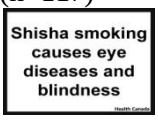
Significant difference at $p < 0.05$; Non-significant difference at $p \geq 0.05$

***** Significant difference after adjusting for multiple comparison using Benjamini Hochberg test

6.3.2 Ratings of Eye Diseases Warnings

Table 3.2 shows ratings for the eye disease warning labels. Significant differences were observed for 5 of the 15 measures: all of which were related to reaction to and perception of warning labels. With respect to differences between text and graphic warnings, graphic warnings had significantly higher ratings for only one measure, which remained significant after adjusting for multiple comparisons. Whereas text warnings were originally rated more likely to "make smokers want to quit," "prevent young people from starting to smoke," and to be "relevant" and "surprising." After adjusting for multiple comparisons, text-only warnings were rated higher for only "make smokers want to quit."

Table 3.2 Labels ratings for "Eye Disease Warnings"

Eye Diseases	**Condition 2 Text** (n=117)  **Mean (SD)**	**Condition 3 Graphic warnings** (n=125) 	**P value**
Grabs your attention	6.5 (2.6)	8.4 (2.0)	**P<0.001***
Is believable	4.6 (2.4)	5.1 (2.6)	P=0.124
Is understandable	6.4 (2.8)	5.8 (2.8)	P=0.122
Is relevant to you	5.5 (2.6)	4.8 (2.7)	**P=0.028**
Is surprising	7.8 (2.0)	7.2 (2.6)	**P=0.045**
Is frightening	6.9 (2.6)	6.8 (2.7)	P=0.986
Is disgusting	5.6 (2.6)	6.0 (2.9)	P=0.303
Is unpleasant	6.6 (2.6)	6.7 (2.8)	P=0.710
Concerned about the health risks	6.4 (2.6)	5.8 (2.7)	P=0.065

Prevent young people from starting to smoke	6.0 (2.5)	5.2 (2.7)	**P=0.017**
Would make smokers want to quit	5.7 (2.6)	4.7 (2.6)	**P=0.002***
Would make smokers want to smoke	3.4 (2.2)	3.0 (2.2)	P=0.138
How effective is the warning label	5.9 (2.5)	5.7 (2.2)	P=0.401
Warning label make you feel about shisha smoking	4.3 (2.0)	4.4 (1.8)	P=0.621
How accurately the WL depict the risks to health	5.3 (2.3)	4.9 (2.3)	P=0.280

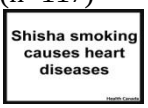
Significant difference at $p < 0.05$; Non-significant difference at $p \geq 0.05$

***** Significant difference after adjusting for multiple comparison using Benjamini Hochberg test

6.3.3 Ratings of Heart Diseases Warnings

Table 3.3 shows ratings for the heart diseases warning labels. Significant differences were originally observed for 4 of the 15 measures, mostly those concerned with affective reactions. Text-only warnings had significantly higher ratings for three measures including being "understandable and relevant" and "depict the risks to health" whereas graphic warning labels were rated as more likely to be "unpleasant." However, after adjusting for multiple comparisons, graphic warnings were not rated as significantly more "unpleasant."

Table 3.3 Labels ratings for "Heart Disease Warning"

Heart Disease	**Condition 2 Text** (n=117) 	**Condition 3 Graphic warnings**(n=125) 	**P value**
	Mean (SD)		
Grabs your attention	6.5 (2.3)	6.6(2.7)	P=0.742
Is believable	6.7 (2.0)	6.5 (2.2)	P=0.464
Is understandable	7.6 (1.8)	6.6 (2.5)	**P<0.001***
Is relevant to you	6.1(2.2)	5.2 (2.7)	**P=0.005***
Is surprising	5.3 (2.5)	5.5 (2.7)	P=0.634
Is frightening	6.2 (2.4)	6.3 (2.6)	P=0.797
Is disgusting	5.3 (2.6)	5.8 (2.8)	P=0.142
Is unpleasant	6.0 (2.5)	6.7 (2.5)	**P=0.049**
Concerned about the health risks	6.8 (2.0)	6.4 (2.4)	P=0.150
Prevent young people from starting to smoke	5.9 (2.4)	5.5 (2.4)	P=0.256

Would make smokers want to quit	5.7 (2.3)	5.4 (2.4)	P=0.327
Would make smokers want to smoke	3.4 (2.3)	3.1 (2.3)	P=0.272
How effective is the warning label	6.2 (2.0)	6.1 (2.2)	P=0.605
Warning label make you feel about shisha smoking	4.6 (2.1)	4.3 (2.0)	P=0.290
How accurately the WL depict the risks to health	6.3 (2.0)	5.5 (2.3)	**P=0.005***

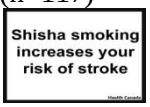
Significant difference at $p < 0.05$; Non-significant difference at $p \geq 0.05$

***** Significant difference after adjusting for multiple comparison using Benjamini Hochberg test

6.3.4 Ratings of Stroke Warnings

Table 3.4 shows ratings for the stroke warning labels. Significant differences were observed for 9 of the 15 measures: Graphic warnings had significantly higher ratings for all those measures. Graphic warning labels were rated as more likely to be "surprising," "frightening" "disgusting," and "unpleasant." They were also rated more likely to "prevent young people from starting to smoke," and "would make smokers want to quit and concerned about health risks." All the measures remained significant after adjusting for multiple comparisons.

Table 3.4 Labels ratings for "Stroke Warnings"

Stroke Disease	**Condition 2 Text** (n=117) 	**Condition 3 Graphic warnings** (n=125) 	**P value**
	Mean (SD)		
Grabs your attention	6.4 (2.3)	8.1(2.2)	**P<0.001***
Is believable	6.2 (2.3)	6.4 (2.4)	P=0.503
Is understandable	7.0 (2.3)	6.7 (2.5)	P=0.357
Is relevant to you	5.5 (2.3)	5.4 (2.7)	P=0.772
Is surprising	5.7 (2.5)	6.8(2.5)	**P=0.001***
Is frightening	6.2 (2.5)	7.4 (2.4)	**P<0.001***
Is disgusting	5.2 (2.6)	7.5 (2.5)	**P<0.001***
Is unpleasant	6.1 (2.5)	7.8 (2.1)	**P<0.001***
Concerned about the health risks	6.3 (2.3)	7.3 (2.2)	**P<0.001***
Prevent young people from starting to smoke	5.4 (2.5)	6.6 (2.4)	**P<0.001***

Would make smokers want to quit	5.4 (2.3)	6.4 (2.5)	**P=0.002***
Would make smokers want to smoke	3.5 (2.1)	3.1 (2.5)	P=0.154
How effective is the warning label	6.0 (2.1)	6.9 (2.2)	**P=0.001***
Warning label make you feel about shisha smoking	4.6 (1.8)	4.2 (2.2)	P=0.197
How accurately the WL depict the risks to health	5.9 (2.0)	6.2(2.2)	P=0.312

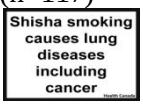
Significant difference at $p< 0.05$; Non-significant difference at $p\geq 0.05$

***** Significant difference after adjusting for multiple comparison using Benjamini Hochberg test

6.3.5 Rating of Lung Disease Warnings

Table 3.5 shows ratings for the lung disease warning labels. Significant differences were observed for 5 of the 15 measures including responses as being "disgusting," "unpleasant," "grabs the attention, " "concerned about the health risks," and "prevent young people from starting to smoke." Before adjusting for multiple comparisons, Graphic warnings had significantly higher ratings for all those measures. However, only "grabs the attention," and being "disgusting," were significant after adjusting for multiple comparisons.

Table 3.5 Labels ratings for "Lung Disease Warnings"

Lung Diseases	**Condition 2 Text** (n=117)  **Mean (SD)**	**Condition 3 Graphic warnings** (n=125) 	**P value**
Grabs your attention	6.5 (2.2)	7.5(2.5)	**P=0.002***
Is believable	7.2 (2.1)	7.2 (2.3)	P=0.974
Is understandable	7.6 (2.0)	7.8 (2.1)	P=0.359
Is relevant to you	6.4 (2.4)	6.0 (2.8)	P=0.218
Is surprising	4.6 (2.6)	5.2 (2.8)	P=0.078
Is frightening	6.6 (2.3)	6.8 (2.7)	P=0.635
Is disgusting	5.5 (2.6)	6.8(2.7)	**P<0.001***
Is unpleasant	6.2 (2.4)	6.9 (2.6)	**P=0.023**
Concerned about the health risks	6.7 (2.2)[b]	7.4 (2.3)[c]	**P=0.022**
Prevent young people from starting to smoke	5.9 (2.4)	6.6 (2.4)	**P=0.036**

Would make smokers want to quit	5.8 (2.4)	6.3 (2.5)	P=0.128
Would make smokers want to smoke	3.3 (2.2)	3.1 (2.1)	P=0.451
How effective is the warning label	6.5 (2.2)	6.9 (2.2)	P=0.151
Warning label make you feel about shisha smoking	4.2 (2.0)	4.1 (2.2)	P=0.600
How accurately the WL depict the risks to health	6.5 (2.2)	6.7 (2.3)	P=0.448

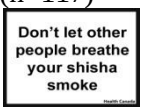
Significant difference at $p < 0.05$; Non-significant difference at $p \geq 0.05$

***** Significant difference after adjusting for multiple comparison using Benjamini Hochberg test

6.3.6 Ratings of Second Hand Smoke Warnings

Table 3.6 shows ratings for second hand smoke warning labels. Significant differences were observed for 11 of the 15 measures. Significant differences remained the same after adjusting for multiple comparisons: Text-only warnings had significantly higher ratings for nine measures. Graphic warnings were rated more likely to be "believable," and "make smokers want to smoke."

Table 3.6 Labels ratings for "Second Hand Smoke Warnings"

Second Hand	**Condition 2 Text** (n=117) 	**Condition 3 Graphic warnings** (n=125) 	**P value**
	Mean (SD)		
Grabs your attention	5.1 (2.5)	5.1(2.5)	P=0.963
Is believable	4.9 (2.4)	5.9 (2.6)	**P=0.001***
Is understandable	5.9 (2.7)	6.3 (2.6)	P=0.269
Is relevant to you	5.3 (2.6)	5.1 (2.7)	P=0.758
Is surprising	4.4 (2.8)	3.5 (2.5)	**P=0.009***
Is frightening	3.5 (2.5)	2.4 (2.1)	**P<0.002***
Is disgusting	3.4 (2.5)	2.2 (2.2)	**P<0.001***
Is unpleasant	3.8 (2.4)	2.6 (2.3)	**P<0.001***
Concerned about the health risks	4.2 (2.6)	3.3 (2.5)	**P=0.010***
Prevent young people from starting to smoke	3.4 (2.4)	2.5 (2.3)	**P=0.003***
Would make smokers want to quit	3.0 (2.2)	2.2 (1.9)	**P=0.002***
Would make smokers want to smoke	4.0 (2.5)	5.3 (3.1)	**P<0.001***

How effective is the warning label	3.7 (2.4)	2.9 (2.2)	**P=0.004***
Warning label make you feel about shisha smoking	5.2 (1.9)	5.4 (2.1)	P=0.293
How accurately the WL depict the risks to health	4.0 (2.3)	3.4 (2.2)	**P=0.035***

Significant difference at $p < 0.05$; Non-significant difference at $p \geq 0.05$

***** Significant difference after adjusting for multiple comparison using Benjamini Hochberg test

6.3.7 Labels Rating Index: Comparison of Means

Table 3.7 shows the results of the label rating index comparison of means. Significant differences were observed for 4 of the 15 measures, including "grabbing the attention," "frightening," "disgusting," and "unpleasant." With respect to differences between text and graphic warnings, Graphic warnings had significantly higher ratings for these measures. Only the two measures "grabs the attention," and being "disgusting," were significant after adjusting for multiple comparisons.

Table 3.7 Labels Ratings Index: Comparison of Means

Rating Index Compare of Means	**Condition 2 Text** (n=117) **Mean (SD)**	**Condition 3 Graphic warnings** (n=125)	**P value**
Grabs your attention	6.3 (1.7)	7.4(1.6)	**P<0.001***
Is believable	6.1(1.6)	6.3 (1.6)	P=0.209
Is understandable	7.0 (1.5)	6.8 (1.7)	P=0.322
Is relevant to you	5.8 (1.8)	5.3 (2.0)	P=0.050
Is surprising	5.7 (1.6)	6.0 (1.6)	P=0.088
Is frightening	5.9 (1.8)	6.4 (1.6)	**P=0.025**
Is disgusting	5.3 (1.9)	6.2 (1.7)	**P<0.001***
Is unpleasant	5.9(1.8)	6.4 (1.6)	**P=0.019**
Concerned about the health risks	6.1 (1.6)	6.2 (1.7)	P=0.493
Prevent young people from starting to smoke	5.4 (1.8)	5.5 (1.7)	P=0.555
Would make smokers want to quit	4.8 (1.6)	4.6 (1.5)	P=0.199
Would make smokers want to smoke	3.9 (1.7)	4.0 (1.5)	P=0.414

How effective is the warning label	5.8 (1.6)	6.0 (1.6)	P=0.327
Warning label make you feel about shisha smoking	4.5 (1.4)	4.4 (1.4)	P=0.552
How accurately the WL depict the risks to health	5.7 (1.5)	5.6 (1.5)	P=0.638

Significant difference at $p < 0.05$; Non-significant difference at $p \geq 0.05$

***** Significant difference after adjusting for multiple comparison using Benjamini Hochberg test

6.3.8 Regression Model for the measure" How effective is the warning label"

Table 5.1 displays the results of a regression model for "how effective is the warning label." A multiple regression was conducted with the following predictor variables: gender, age, education, shisha smoking status (frequency of use), income, ethnicity, health status, cigarette smoking, intend to quit, and conditions. The model produced an R square of 0.08, which was not statistically significant. None of the covariates showed significant association with warning label effectiveness. Intention to quit was positively related to warning label effectiveness. More specifically, participants who reported having an intention to quit rated warning labels as higher on effectiveness than participants who did not have the intention to quit.

Table 3.8 Regression model: warning labels effectiveness (n=342)

	Beta	**T**	**95% CI**	**P value**
Gender	-0.239	-1.405	-0.574, 0.096	P=0.161
Age	-0.012	-0.419	-0.070, 0.045	P=0.676
Education	-0.021	-0.103	-0.423, 0.381	P=0.918
Shisha smoke Statu4=Ref				
Shisha Smoke status1	0.053	0.140	-0.684, 0.789	P=0.888
Shisha smoke status2	0.259	0.632	-0.546, 1.063	P=0.528
Shisha smoke status3	0.350	0.599	-0.799, 1.499	P=0.549
Ethnicity(Ethnicity4=Ref				
Ethnicity1	-0.079	-0.320	-0.444, 0.398	P=0.749
Ethnicity2	-0.023	-0.106	-0.386, 0.733	P=0.916
Ethnicity3	0.173	0.609	-0.393, 0.578	P=0.543
Income (income1=Ref)				
Income2	-0.377	-1.579	-0.847, 0.093	P=0.115
Income3	-0.391	-1.711	-0.841, 0.059	P=0.088
Income4	-0.428	-1.626	-0.946, 0.090	P=0.105
Health	0.093	0.375	-0.393, 0.578	P=0.708

Cigarette smoking	0.116	0.594	-0.269, 0.501	P=0.553
Condition (cond1=Ref)	-0.011	-0.054	-0.421, 0.398	P=0.957
Condition2	0.190	0.928	-0.213, 0.592	P=0.354
Condition3				
Intend to quit	0.686	4.034	0.351, 1.021	**P<0.001**
Model R Squared		0.086		

6.4 Patterns of Shisha Use, Beliefs about Shisha Use, Health Knowledge , and Behaviour —at Follow-Up:

Follow-up survey was conducted for each participant after two weeks (14 days) estimated from the first day of data collection. GEE models were conducted to examine differences in responses between the experimental conditions from baseline to follow-up for all the study indices; key measures include pattern of shisha use, knowledge, health beliefs and attitude, perception of harm, and perceived behavioural control and quit Intentions. The GEE method was used as it treats each participant as a cluster of responses allowing for analysis of the overall group trend.

6.4.1 Patterns of Shisha Use among Experimental Groups —at Follow-Up

Table 4.1 shows the pattern of shisha use among experimental groups at follow-up and the differences from baseline. Overall, no significant differences were detected between conditions in the follow-up. However, the results reveal a pattern of findings in which there was a decline in the number and length of sessions as well as the number of hagar consumed among conditions. Compared to the Graphic warning condition, there was an increase in the time of shisha consumption per week in the Nutrition and Text-only conditions. GEE models revealed a significant difference between the Nutrition and Text-only conditions with regard to the decrease in the number of sessions. No other significant differences between conditions were detected concerning consumption patterns.

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Table 4.1 Pattern of shisha use among participants at follow-up and the differences in responses from baseline.

	Condition 1 Nutrition (n=100) **W2** **+/-****	**Condition 2 Text** (n=117) **W2** **+/-**	**Condition 3 Graphic warning** (n=125) **W2** **+/-**	**P value**
Average frequency of shisha smoking in the last 2 weeks Less than once/week	56.0% (-3.0)	59.0% (-5.1)	63.2% (+ 0.8)	$X^2 = 1.2$ P=0.541
Average Number of sessions Less than one session	34.0% (+14.0)	48.7% (+23.1)	45.6% (+19.2)	$X^2 = 5.1$ P=0.077
Average number of Hagar Less than once/week	41.0% (+15.0)	46.2% (+16.3)	48.8% (+17.6)	$X^2 = 1.4$ P=0.501
Average length of session Less than 45 min	41.0% (+10.0)	48.7% (+11.1)	51.2% (+ 20.0)	$X^2 = 2.4$ P=0.294

Different letters between groups = Significant difference (P<0.05; same letters between group means =Non significant difference (P≥0.05)

****** Differences in follow-up responses from baseline

6.4.2 Knowledge, Health Beliefs & Attitude among Participants—at Follow-Up

Table 4.2 shows the knowledge, health beliefs, and attitudes among participants at follow-up. Significant differences between conditions at the follow-up were detected in some responses related to knowledge, health beliefs, and attitude.

Positive difference in responses from baseline to follow-up in the Graphic warning labels condition revealed an increase in health beliefs about shisha smoking. The GEE model revealed a significant difference between responses from participants in the Graphic warning condition versus participants in the Nutrition and Text-only warnings conditions. Participants in the Graphic warning labels condition reported higher levels in the belief that shisha smoking is dangerous to non-smokers compared to participants in the Nutrition and Text-only warnings conditions. In addition, participants who had viewed graphic warning labels reported an increase in the belief that shisha smoking is harmful to health, and that if they were to start over, they would not have started smoking. Those who viewed graphic warnings also reported higher levels of endorsement for implementing warning labels for shisha. On the other hand, no significant differences were detected between the shisha warning conditions (text and graphic combined) versus the nutrition warnings in that belief. However, those who viewed graphic warnings reported a smaller increase in the belief that there is an absence of medical evidence linking shisha smoking to health effects in the follow-up, compared to those who viewed Text-only labels. Nevertheless, both the Text-only and Graphic conditions were significantly different from Nutrition labels condition that showed a decline in that belief at follow-up.

Positive difference in responses from baseline to follow-up in the Text-only and Graphic warning label conditions reveals an improvement in health

knowledge. There was a positive difference in responses, which acknowledged that shisha smoking is associated with lung diseases including cancer and agreed that it is linked to emphysema and second hand smoke in both Text-only and Graphic conditions. The GEE model revealed a significant difference between responses from participants in Text-only and Graphic conditions versus participants in the Nutrition label condition with regard to lung disease, second hand smoke and bladder cancer. However, after adjusting for multiple comparisons using Benjamini Hochberg method, no significant differences were detected between conditions regarding their knowledge linking shisha to lung diseases and emphysema. Similarly, GEE models with combined experimental conditions versus nutrition warnings showed that there were no significant differences between conditions with regards to shisha smoking and emphysema. Overall, results revealed a pattern in the findings in which there was an improvement in health knowledge mostly among those who viewed graphic warning labels.

Table 4.2 Knowledge, health beliefs, and attitudes among participants at follow-up and the differences in responses from baseline.

	Condition 1 Nutrition (n=100) **W2 +/-****	**Condition 2 Text** (n=117) **W2 +/-**	**Condition 3 Graphic warnings** (n=125) **W2 +/-**	**P value**
Shisha is dangerous to Non smokers Agree	39.0% (+2.0)[a]	50.4% (+8.5)[a]	63.2% (+23.2)[b]	$X^2 = 13.2$ **P=0.001****
No medical evidence that shisha is harmful Do not agree	41.0% (-10.0)[a]	55.6% (+8.6)[b]	57.6% (+4.0)[b]	$X^2 = 7.01$ **P=0.030**
Not flavored shisha is better Do not agree	57.0% (+1.0)	61.5% (+6.8)	70.4% (+12.0)	$X^2 = 3.5$ P=0.171

Occasional shisha smoking doesn't damage your health Do not agree	52.0% (+6.0)	65.8% (+23.1)	60.8% (+15.2)	$X^2 = 2.5$ P=0.283
If start over, no shisha Agree	21.0% (+7.0)	18.8% (+ 0.9)	21.6% (+8.8)	$X^2 = 0.3$ P=0.854
It is difficult to quit shisha Agree	16.0% (+6.0)	12.0% (+ 0.0)	10.4% (-3.2)	$X^2 = 1.6$ P=0.439
Shisha should include HW labels Agree	53.0% (+0.0)[a]	63.2% (-3.5)[a]	70.4% (+5.6)[b]	$X^2 = 7.2$ **P=0.027**
Worried shisha will damage your health Worried	50.0% (+2.0)	56.4% (-2.6)	60.0% (+5.6)	$X^2 = 2.3$ P=0.320
Does shisha smoking cause lung disease including cancer Yes	56.0% (-1.0)[a]	70.1% (+10.3)[b]	71.2% (+12.8)[b]	$X^2 = 6.8$ **P=0.033**
Does shisha smoking cause Heart disease Yes	45.0% (+12.0)	56.4% (+17.1)	58.4% (+19.2)	$X^2 = 4.5$ P=0.105
Does shisha smoking cause Mouth disease including cancer Yes	57.0% (+3.0)	61.5% (+9.4)	70.4% (+13.6)	$X^2 = 4.6$ P=0.101
Does shisha smoking cause Stroke and blood clots Yes	34.0% (+7.0)	42.7% (+11.1)	46.4% (+18.4)	$X^2 = 3.6$ P=0.163
Does shisha smoking cause Emphysema Yes	29.0% (0.0)[a]	39.3% (+6.0)[ab]	46.4% (+10.4)[b]	$X^2 = 7.1$ **P=0.029**

Does shisha smoking cause Alzheimer's disease Yes	16.0%	(+9.0)	12.0%	(+6.9)	10.4%	(+4.0)	$X^2 = 1.6$ P=0.439
Does shisha smoking cause Bladder cancer Yes	9.0%	(-1.0)[a]	23.1%	(+14.6)[b]	28.8%	(+20.0)[b]	$X^2 = 13.5$ **P=0.001****
Does shisha smoking cause Lung disease for non-smokers Yes	37.0%	(-7.0)[a]	53.0%	(+9.9)[b]	56.8%	(+12.8)[b]	$X^2 = 9.5$ **P=0.009****
Does shisha smoking cause Parkinson's disease No	49.0%	(-4.0)[a]	35.0%	(-18.1)[b]	28.8.%	(-24.8)[b]	$X^2 = 9.9$ **P=0.007****
Does shisha smoking cause Eye disease and blindness Yes	9.0%	(+6.0)	12.8%	(+8.5)	19.2%[b]	(+14.4)	$X^2 = 5.0$ P=0.082

Different letters between groups = Significant difference ($P<0.05$); same letters between group means =Non significant difference ($P\geq0.05$)

*****Differences in follow-up responses from baseline

****** Significant difference after adjusting for multiple comparison using Benjamini Hochberg test

6.4.3 Perceptions of Harm among Participants—at Follow-Up

Table 4.3 presents perceptions of harm. Although there was an increase across conditions in the belief that shisha smoking is harmful to health, the GEE model showed no significant differences between conditions. However, participants who viewed Text-only warnings showed a positive difference with regard to thinking of the harm shisha smoking causes, and this difference was significant compared to those who viewed nutrition labels.

Table 4.3 Perceptions of harm among participants at follow-up and the differences in responses from baseline.

	Condition 1 Nutrition (n=100)		**Condition 2 Text** (n=117)		**Condition 3 Graphic warnings** (n=125)		**P value**
	W2	**+/-****	**W2**	**+/-**	**W2**	**+/-**	
Overall opinion of Shisha Bad	22.0%	(+11.0)	26.5%	(+13.7)	32.0%	(+20.8)	$X^2 = 2.9$ P=0.241
How good or bad shisha to your health Bad	49.0%	(-10.0)	59.0%	(+4.3)	61.6%	(+0.8)	$X^2 = 3.9$ P=0.144
Compared to cig, Shisha is More harmful	28.0%	(+5.0)	35.0%	(+11.1)	38.4%	(+7.2)	$X^2 = 2.7$ P=0.256
Did you think of how much you enjoy shisha smoking No	29.0%	(-14.0)	35.0%	(-10.3)	38.4%	(-7.2)	$X^2 = 2.2$ P=0.334
Do you think about the harm smoking cause Yes	51.0%	(0.0)	65.8%	(+17.1)	53.6%	(+7.2)	$X^2 = 5.8$ P=0.056

*Different letters between groups = Significant difference (P<0.05; Same letters between group means =Non significant difference (P≥0.05)

****** Differences in follow-up responses from baseline

6.4.4 Perceived Behavioural Control & Quit Intentions among Participants—at Follow-up:

Table 4.4 shows the perceived behavioural control and quit intentions among participants at follow-up. However, the GEE model showed no significant differences between conditions, the results revealed a pattern in the findings were differences in responses ,with regards to intention to quit shisha smoking, were relatively higher among participants in Graphic warning condition compared to the Text-only and Nutrition labels conditions. However, significant differences were detected between the Text-only and the Graphic warnings versus the Nutrition warnings with regard to deciding not to smoke even when tempted to do so. Little difference was found from baseline to follow-up across the Text-only and Graphic warning labels conditions with regard to the belief that quitting shisha permanently was difficult. However, significant differences were detected between the Text-only and Graphic warnings, compared to the Nutrition labels condition using the combined GEE model. Moreover, participants who viewed Graphic warnings made greater attempts to quit and were more likely to stop smoking the hagar before finishing, from baseline to follow-up compared to those who viewed Nutritional labels.

Table 4.4 Perceived behavioural control and quit intentions among participants at follow-up and the differences in responses from baseline.

	Condition 1 Nutrition (n=100)		**Condition 2 Text** (n=117)		**Condition 3 Graphic warnings** (n=125)		**P value**
	W2	**+/-****	**W2**	**+/-**	**W2**	**+/-**	
Do you consider quitting shisha smoking Yes	43.0%	(+15.0)	51.3%	(+12.8)	48.8%	(+20.8)	$X^2 = 1.5$ P=0.463
Do you think about the cost of smoking Yes	46.0%	(+3.0)	41.9.%	(-0.8)	44.0%	(+5.6)	$X^2 = 0.4$ P=0.830
Do you intend to quit shisha smoking Yes	44.0%	(+5.6)	47.9%	(+6.9)	56.0%	(+18.4)	$X^2 = 3.4$ P=0.179
Have you ever stopped before finishing the hagar Yes	17.0%	(0.0)	23.9%	(+3.4)	30.4%	(+16.8)	$X^2 = 5.4$ P=0.066
Have you made any attempts to stop shisha in last 2 wks Yes	24.0%	(+12.0)	31.6%	(+20.5)	36.0%	(+25.6)	$X^2 = 3.8$ P=0.152
Tempted to smoke, but decided not to Yes	48.0%	(+38.0)	59.8%	(+15.4)	46.4%	(+4.8)	$X^2 = 5.0$ P=0.080
How easy or difficult to permanently quit Difficult	21.0%	(-17.0)	17.9%	(+3.4)	15.2%	(+1.6)	$X^2 = 1.3$ P=0.528

*Different letters between groups = Significant difference ($P<0.05$); same letters between group means =Non significant difference ($P\geq0.05$)

****** Differences in follow-up responses from baseline

7.0 DISCUSSION

The aim of the current study was to better understand the impact of viewing health warning labels on the perceptions, attitudes, and smoking behaviours of shisha users. In contrast to the large evidence base on health warnings on cigarette packages, to our knowledge, this study is the first to examine the effect of health warning messages on shisha smokers.

7.1 Patterns of shisha use

The current study was one of the first to assess patterns of shisha use among Canadian users. At baseline, more than one-third of the participants reported smoking shisha more than once per week. Around three-quarters of the sample had more than one session of shisha smoking per week spending 45 minutes or more per session, and had more than one hagar per week. Overall, there were no significant differences between conditions regarding their pattern of shisha smoking. No other published studies on the pattern of use among Canadians are available. Findings from other countries find it fairly similar to ours**.** For example, in a study conducted on British University students, half of the participants who were regular shisha smokers, smoked shisha once or more per week (19). In a study conducted in Syria, the pattern of shisha smoking was occasional on a less than daily basis (60).

Few significant differences in shisha use were detected between conditions at follow-up. Significant differences were only detected in regard to a decrease in the number of sessions, which was greater among participants who viewed text warnings in comparison to those who viewed nutrition labels. A decrease in the time spent in shisha consumption per week among participants who viewed graphic warning labels

was observed compared to those who viewed text-only and nutrition warnings. In several cases, behavioural changes from baseline to follow-up were greater in the Graphic condition—for example, a greater proportion of participants in the Graphic warning labels condition reported smoking one per week or less, and using shisha for shorter periods—however these differences failed to reach statistical significance.

These findings indicate relative little impact of viewing health warnings on subsequent shisha use. The lack of behavioural effects is likely due to two factors: first, the study had relatively low statistical power to detect differences, given the modest sample sizes. For example, the current study only had power to detect differences of approximately 18% on average given the sample size. Second, the level and frequency of exposure to health warnings in the current study was significantly weaker than in a regulated environment, in which exposure to health warnings typically occurs at the time of purchase and smoking behaviour, and in a much greater frequency. It is may not be plausible to expect a very brief exposure to online warnings to affect subsequent smoking behaviour, particularly within the context of a research study.

Furthermore, compared to cigarette smoking, shisha smoking is more culturally and socially acceptable (6,99).In addition, shisha is less regulated (44), which makes it more noticeable in most cafes in spite of legislation that bans tobacco smoking in public (65) not to mention that shisha also can be smoked freely at homes. These factors make it a popular, acceptable, and easier tool for social interaction and use (19), which considerably affect the pattern of consumption.

7.2 Knowledge, Health Beliefs & Attitude

At baseline, almost half of the participants in each condition did not believe that medical evidence existed linking shisha to harmful health effects and believed that occasional shisha smoking would not damage their health. Furthermore, they reported not being worried about the health effects of occasional shisha smoking. More than three-quarters of the sample disagreed with the statement that if they were to start over, they would not smoke shisha. These findings are similar to previous studies indicating that shisha smokers believed that shisha smoking was a less dangerous form of tobacco smoking compared to cigarette smoking (6,19).

Follow-up results revealed an increase in the belief that shisha is dangerous to non-smokers, among those who viewed graphic warnings compared to those who viewed text-only or nutrition labels. Therefore, viewing graphic warning labels significantly increased the belief that shisha is dangerous to non-smokers. In addition, the findings indicated that participants who viewed graphic warning labels reported an increase in worry about the effect of shisha on their health, as well as regret over starting shisha use. Moreover, participants who viewed graphic warning labels were more likely to support the addition of health warnings on shisha. These results are consistent with findings from studies suggesting that larger and more graphic warnings with enhanced colors have an impact on cognitive processing, smoking related beliefs, perceptions of risk, and behaviour among viewers (26,80, 86, 89, 100, 101, 102).

With regards to health knowledge, no differences were found at baseline between the groups in their knowledge about the health effects caused by shisha smoking. More than 90.0% of users within each condition did not know that bladder

cancer, Alzheimer disease, and eye diseases were associated with shisha smoking. In addition, around two-thirds of users in each condition disagreed with the association between shisha smoking and stroke, emphysema, and heart disease. These results are consistent with findings from several studies that report a lack of health knowledge surrounding shisha use (1,103).Similar findings have been reported for the association between cigarette smoking and stroke, in that respondents fail to believe that smoking can cause stroke (77,79).

At follow-up, the majority of participants who viewed graphic and text-only warning labels showed significant increases in their knowledge about the health effects of shisha use. Compared to participants who viewed nutrition warnings, participants who viewed shisha warnings were more likely to agree that shisha smoking was associated with lung diseases including cancer and more likely to agree that shisha smoking was linked to emphysema, second hand smoke, and bladder cancer. However, there were no significant differences in health knowledge between the text-only and graphic warning conditions.

These findings are consistent with previous research demonstrating that health warnings can increase health knowledge (79, 87, 104). For example, Hammond and his colleagues (2006) found a strong association between the specificity of the health warnings in each of the four countries and levels of health knowledge for specific health effects. For example, participants from Canada who were exposed to warnings about impotence were three times more likely to believe that smoking causes impotence compared to participants from the other three countries (79).

Although there were no significant differences between the graphic and text warnings at follow-up regarding health knowledge, it should be noted that measures

of knowledge had increased to a greater extent for 8 of 10 diseases in the graphic versus text condition, however, these differences failed to reach statistical significance. Therefore, although the differences between graphic and text warnings in the current study were not as robust as studies on cigarette warnings, the findings are not inconsistent.

The non-significant differences between the Graphic and Text-only conditions in health knowledge could be due to the fact that participants have been subjected to these warnings for only a short time and their knowledge will be improved with longer periods of exposure to graphic warnings. It can also be due to the absence of shisha images in most of these graphic warnings to link it to the warning messages. For example, if the viewed graphic warning labels were accustomed specifically with images of shisha, it is possible more of an effect would have been seen. In addition, if the images were to be placed on actual shisha, this might have created a greater impact. Further, most of these images were of diseases, which most people generally believe are associated with older individuals, and since most of the sample was younger (mean 21.8 years), using pictures relating to diseases more relevant to a younger population may have had a larger impact. Lastly, due to the fact that most smokers are resistant to health messages and more likely to rationalize their behaviour (24,68), they may not be highly affected by such messages.

7.3 Smokers' Perception of Harm

At baseline, more than three-quarters of participants thought that shisha smoking is not harmful to one's health and considered it less harmful than cigarettes, however, almost half of the participants thought about the harm shisha smoking causes to their health.

In the follow-up, no significant differences were found between conditions, possibly due to the fact that most shisha smokers may not perceive shisha as harmful, especially when compared to cigarettes. This is consistent with findings from previous research demonstrating that students did not believe shisha smoking was harmful to their health (19), or thought shisha was a less harmful alternative to tobacco consumption (6). Another explanation may be that some tobacco smokers find some warning labels irrelevant. For example, a qualitative study conducted by O'Hegarty et al. (2007) found that many of the participants from both the United States and Canada perceived warnings as a scaring approach and not a true representative of the health risks associated with smoking (24).

Nevertheless, results showed that participants who viewed Text-only warning labels showed an increase in thinking about the harm shisha smoking causes and an overall increase in the pattern of participants' negative opinion against shisha. These findings suggest that viewing warning labels had increased perceptions of harm. This is consistent with findings from a review conducted by Hammond (2011), which found that graphic and enhanced text warnings had dramatically increased smokers' perception of harm and health risks associated with smoking in several studies across the world (88). Unexpectedly, while those who viewed graphic warning labels showed an increase in perceptions of harm, the effect of graphic warnings was still lower than those who viewed text-only warnings. This could partly be due to the fact that viewers may take a longer time to adjust and become accustomed to the graphic warnings in comparison to the text labels (29).

7.4 Perceived Behavioural Control & Quit Intentions

At baseline, around two-thirds of the sample did not consider quitting shisha smoking. More than three-quarters of the sample did not made any attempts to stop shisha in the last two weeks and never stopped smoking before finishing the "hagar." However, almost three-quarters of the participants thought that quitting shisha permanently is easy. This set of findings is consistent with results from previous research demonstrating that shisha smokers believed they could easily quit shisha, but did not feel the need to stop shisha smoking (19, 61).

At follow-up, neither quit intentions nor behavioural control met the expectations for a significant change however, there was an overall increase in the intentions to quit shisha smoking and attempts to quit. Overall, differences in responses from baseline were relatively higher among participants who viewed graphic warnings compared to those who viewed nutrition warnings. However, those who viewed tobacco Graphic or Text-only warning labels perceived quitting shisha permanently as difficult at higher levels than those who viewed nutritional labels.

These findings are consistent with our prediction that warning labels have an effect on quit intentions. This is consistent with previous evidence on cigarette package health warnings. A longitudinal study conducted by Hammond et al. (2003) found that participants who cognitively processed graphic warning labels at baseline were more likely to show quit attempts to reduce cigarette consumption or quit at three month follow-up (80). Another study by Hammond et al.(2006) demonstrated the effectiveness of health warning labels in increasing health knowledge, and intentions to quit (79), similar to more recent findings from Canada conducted by Azagba and Sharaf (2012) (104).

7.5 Warning Label Ratings

Findings indicated that overall, participants reported that health warning labels elicit unfavourable affective reactions including being frightening, disgusting and unpleasant. Participants also thought that warning labels had the ability to grab their attention. Whereas Text-only warnings labels were rated as more likely to be relevant and better able to accurately depict the risks to health. These findings are consistent with the literature on warning labels demonstrating that prominent, rotating graphic warnings covering a significant part of the cigarette package have the same previously mentioned effects (27, 84).

With respect to the difference between text and graphic messages, graphic warnings showed higher ratings in most of the measures for mouth disease, stroke, and lung disease warnings while text warnings showed higher ratings for eye and heart disease as well as second hand smoke.

With regard to the mouth, stroke, and lung cancer warning labels, graphic warnings showed higher ratings in terms of negative affective reactions, in making participants concerned about health risks and in preventing young people from starting to smoke. However, it was notable that mouth warning had low absolute ratings with regard to "making smokers want to quit," and high ratings in "making smokers want to smoke." It is unclear whether the mouth warning may be eliciting defensive avoidance among shisha smokers. (105,106).

Inconsistent findings were observed for the second hand smoke warning label. Participants rated the graphic warnings lower in "making smokers want to quit" and higher in "making smokers want to smoke." Unlike the other warnings used in the study, the second hand smoke warning was developed specifically for the study. The

image used in the warning depicted a shisha smoker looking very relaxed smoking while the woman who is sitting adjacent to him is not expressing any signs of irritation or upset. Therefore, the warning may have elicited a favourable reaction toward shisha smoking. This finding underscores the importance of pre-testing images prior to use in studies or regulatory implementation.

The stroke and lung diseases warnings scored high in ratings in "making participants want to quit"; however, participants perceived the risks of harm from those diseases as somewhat lower than other health warnings. As our sample was younger, participants may have perceived the risk of having stroke as more remote than other health effects. In addition, many shisha smokers think they do not inhale the smoke of shisha deeply. Many shisha smokers also believe that the smoke coming out of the shisha is very smooth and filtered from harmful constituents in contrast to the smoke coming from cigarettes (6). Therefore, perceptions of the risk of lung disease may be lower. This is consistent with the findings from other studies. In a qualitative Canadian study, participants indicated that shisha smoke is healthier compared to cigarette smoke and causes less lung damage. For example, one of the participants in this study stated "It feels light in the throat, not harsh, but smooth…. It means it's not hurting my lungs as much or damaging it." (6)

Results of the regression analyses determined that "how effective is the warning label" was independent of age, gender, education, shisha smoking status, ethnicity, and health. It has been found that income was positively associated with "how effective is the warning label," which implies that participants with low income tend to be more supportive to the effectiveness of warning labels. Low income might be more supportive as they see utility in using the warning labels as an inexpensive way

to help them quit shisha smoking. Policy makers may consider specific content and messaging features of health warnings targeting this group with various related warning labels to tackle shisha consumption among them.

7.6 Limitations

There are a number of limitations that are related to this study. The first limitation is that only six types of health warning labels were used. Although we based our choice on warning labels with potential efficacy based on previous research, future studies may consider testing other types of warnings that may have stronger impact on the sample (young age), such as warnings relating to impotence or skin diseases.

A second limitation relates to the presentation of the health warnings. Due to the online nature of the study, warnings were presented on the computer screen, and did not mimic a real world setting. The labels may have elicited stronger results if they were placed on the shisha itself. In addition, participants could only view warnings for a few minutes, which is unlike the more passive exposure they experience in real-life.

A third limitation in this study is that only shisha smokers were included. There is also a need to understand the impact of health warning labels among non-shisha smokers, which would be of great benefit to prevent those who are susceptible to shisha smoking. Health warnings may have a greater effect discouraging initiation rather than cessation, given that many users are already addicted.

Another limitation is the lack of historical data using similar measures and protocols, As such; we were unable to provide more accurate estimate of the effect size associated with the various outcomes. As a result, the study suffered from low

statistical power, perhaps explaining why many of the results did not reach significance even though the differences were of reasonable magnitude in some cases. For example, we predicted a greater impact on the pattern of shisha use, especially with the observed change in responses among participants in the three conditions from baseline to follow-up; however, no significant differences were detected between conditions. Therefore, we may have detected differences in the pattern of shisha use between the groups with a larger sample.

Probability-based sampling methods were not used to recruit participants and the study sample was not representative of Canadians or shisha users in Canada. For example, the sample was younger, had higher levels of education than the general public, a different ethnic profile. However, the characteristics of the study participants were broadly comparable to the current shisha smokers' population. According to the Canadian Tobacco Use Monitoring Survey (CTUMS), 2011, shisha smoking was more prevalent among males, young adults and may have a higher education profile (22).

In order to examine the success of randomization to the different conditions, we examined differences in the characteristics and main outcomes between conditions at baseline. Participants in the experimental conditions differed on two measures:"tempted to smoke, but decided not to" and "the ease or difficulty of quitting shisha". Although it is not clear why the conditions differed on these measures, no differences were observed for socio-demographic measures or other measures of shisha use

Recall bias in the follow-up is another potential limitation, considering the stimuli were not shown again at follow-up. To address this problem, we purposely

selected a shorter timeline of two weeks to conduct the follow-up. Nevertheless, conducting the follow-up after a longer period of time may have provided insight on the impact of health warning labels on consumption and attitude over time.

In this study, we presented the warning labels in same sizes across the three conditions. However, a limitation that might arise in this study is that participants' responses and ratings to the warnings might differ in relation to the size of the screen of the devise used to conduct the online survey. Future studies that rely on visual stimuli should record information such as screen size and, ideally, exclude devices with particularly small screens.

Another limitation relates to self-report bias. Participants were responsible for filling out the baseline and follow-up questionnaires, as well as rating the warning labels independently. Although the online survey format was chosen to prevent interviewer bias and ensure more honest and accurate responses, answers are mostly subjective and depend on personal reports of beliefs and behaviour with no verification of accuracy.

Self-selection bias is another limitation where some individuals may have been more attracted to complete the online survey than others. Therefore, a systematic bias might have developed based on the likelihood of those individuals to respond to the invitation to join the study than the others. However, considering the random allocation of participants to experimental conditions, it is likely that there was no impact on any differences observed between conditions.

7.7 Future Directions

Although this study sheds light on the impact of health warning labels among shisha smokers, future studies may consider including non-shisha smokers in the sample to enhance our understanding of the impact among the general population. There is a need to repeat this study on a larger sample size over a longer period to rigorously evaluate with higher statistical power whether viewing health warning labels contributes to changes in shisha smoking patterns and behaviour, and whether this change is observed and sustained over longer periods of time. There is also a need to replicate this study with the warnings inserted on the shisha itself. Further examination of specific design elements and content of health warnings directed specifically to shisha smokers in different cultural settings will be critical to ensure the relevance of health warnings in distinct cultural settings.

7.8 Implications and Conclusions

As shisha smoking is increasing globally, the need for a critical action to control shisha smoking consumption is crucial. Investigating the effectiveness of warning labels on shisha smoking will contribute to establishing policies and priority actions appropriate for the prevention of shisha smoking.

The current study found a decline in the number and length of sessions as well as the number of hagar consumed. No significant differences were observed between conditions regarding shisha consumption and patterns of use. However, noticing the labels and having some effect on shisha consumption would only underline the need to introduce warning labels to shisha smokers to direct their attention toward shisha' health hazards to effectively reduce consumption, especially when findings showed an increase in health beliefs among participants who viewed tobacco warning labels

(mainly the graphic warnings). Graphic warnings significantly increased the smokers' beliefs that shisha is harmful to health and dangerous to non-smokers. Participants who viewed graphic warning labels supported the addition of health warnings to shisha.

Findings from this study confirmed the fact that there is a lack of knowledge about the health hazards of shisha. However, the fact that the majority of participants who viewed Graphic and Text-only warning labels at baseline showed significant increases in their health knowledge is promising. Participants who viewed shisha warnings, especially Graphic warnings, were more likely to agree that shisha smoking was associated with lung diseases including cancer and more likely to agree that shisha smoking was linked to emphysema, second hand smoke, and bladder cancer. Overall, pattern in the results revealed an improvement in health knowledge mainly among those who viewed Graphic warning labels.

Nevertheless, pattern of the results showed that participants who viewed Text-only warning labels showed an increase in thinking about the harms of shisha and an overall increase in negative opinions about shisha. This set of findings suggests that viewing warning labels increased perceptions of harm. It was unexpected that although graphic warning labels increased perceptions of harm, the effect of Graphic warnings was still lower than Text-only warning labels. These findings indicate the importance of Text-only messages in drawing participants' attention toward the harm of shisha, and signify the value of graphic warnings in enhancing health beliefs and knowledge. Knowing the differential impact of text and graphic warning labels could be used to develop customized warnings targeting shisha smokers.

Contrary to our predictions, there was no significant differences in quit intentions and behavioural control. However, there was an overall increase in intentions to quit shisha smoking. Overall, pattern of the findings showed that the change in responses from baseline were relatively higher among participants who viewed graphic warnings compared to those who viewed nutrition warnings. These findings indicate that warning labels have the potential to promote quit intentions and behavioural control, which signify the importance to include warning labels on shisha products.

Overall, the findings from the current study indicate that health warnings had an influence on shisha smokers' health beliefs, knowledge, and frequency of shisha consumption. These findings suggest that health warning labels influence participants emotionally and grab their attention. Graphic warnings seemed to improve health knowledge, suggesting that health warnings were effective. These findings highlight the need to extend health warning label policies to include shisha products, and the need for further research to be done on the specific content and message features and themes to ensure that the most effective labels are implemented. Overall, findings provide modest support for the efficacy of shisha warnings on establised users. Findings imply that packaging and labelling policies for shisha and shisha products require additional development.

Introducing tailored warning labels on shisha may be the first step to raising awareness about the health risks associated with shisha-use and subsequently to reduce consumption and enhance quit attempts.

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APPENDICIES

APPENDIX A: RECRUITMENT POSTER (FLYER) & STUDY E-MAIL INVITATION

/ E-MAIL SCRIPT

University of Waterloo

Research Study

Do you smoke shisha or Hooka (a water-pipe for tobacco)? We need your help for *two sessions research study.* You will be asked to view some materials and answer a confidential short online survey.

Volunteers will receive $10Tim Horton's gift card following each of two 15 to 30 minutes sessions.

For information or to volunteer

Please Please call: 519-888-4567 ext. 36631

or e-mail htmohamm@uwaterloo.ca.

This study has received clearance through the Office of Research Ethics, University of Waterloo.

Invitation to participate in Shisha smoking study:

ARE YOU SHISHA(HOOKA) (WATER-PIPE) SMOKER?

My name is Heba Tallah Mohammed and I am a graduate student working under the supervision of Dr. Paul McDonald of the UW Health Studies and Gerontology Department. We would like to invite you to take part in our Study. We are conducting an **online** study that examines the impact of health warning labels on shisha (water-pipe) smoking.

Participation in this study involves completing two online surveys: one to be completed now and the other two weeks from the start date. You will be provided with a link to log in to the survey where you will answer three screening questions to see if you are eligible for the study.

If you are eligible, you will be asked to answer questions related to tobacco use and to view and comment on health warning labels. We will also ask you to answer a short demographic survey.

Approximately two weeks after you complete the first survey, we will send you a reminder by email and mail to complete the second survey. The online surveys will take approximately 20-30 minutes to complete.

As a token of our appreciation, you will receive a $10 Time Horton's gift card after you complete each survey ($20 in total). You will receive the gift card through regular mail.

I would like to assure you that the study has been reviewed and received ethics clearance through the Office of Research Ethics. However, the final decision about participation is yours.

If you are interested in participating in this study, please contact me at htmohamm@uwaterloo.ca and I will then send you a survey link and answer any questions you have. Thank you very much!

Sincerely,

Heba Tallah Mohammed

Shisha use Study — Telephone and e-mail Script

Interested participant will call or e-mail regarding the study.

Hello, Thanks for your interest in our study. My name is Heba Tallah Mohammed from the Department of Health Studies at the University of Waterloo. I'd like to give you some more information about our study. The purpose of the study is to examine the impact of health warning labels on shisha (Hooka) use.

To do this, we're asking participants to complete two waves online survey (one to be completed now and the other two weeks from the starting date). I will provide you with an access code and link to log in to the survey where you will answer three screening questions to see if you are eligible for the study.

If you are eligible, we will ask you to read and answer questions related to tobacco use and health risks and to view some warning labels and to rate them. We will also ask you to answer a short demographic survey.

Each online survey will take approximately 20-30 minutes. As a token of our appreciation, you will receive a $10 Tim Horton's gift card at the end of each survey ($20 in total). You will receive your gift card through regular mail.

Finally, please give us a call or send us an e-mail should you have to withdraw from the study and not participate in the follow-up. My name is Heba Tallah Mohammed and I can be reached at 519-888-4567 ext.36631 or at htmohamm@uwaterloo.ca.

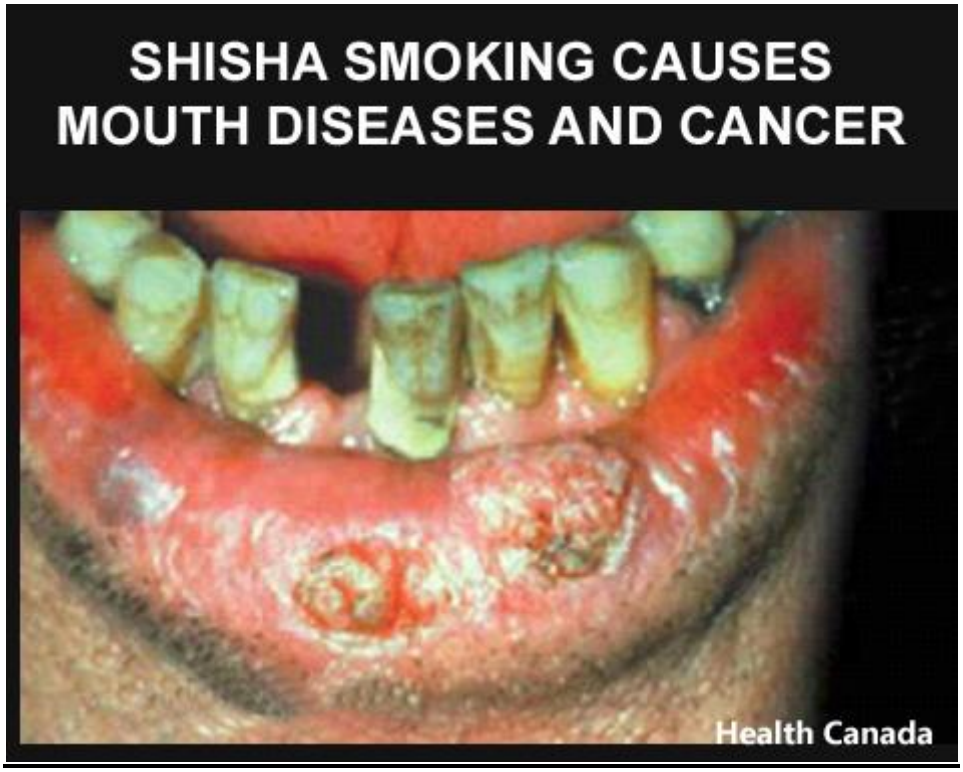
The link to the study is _____and your access code is _____

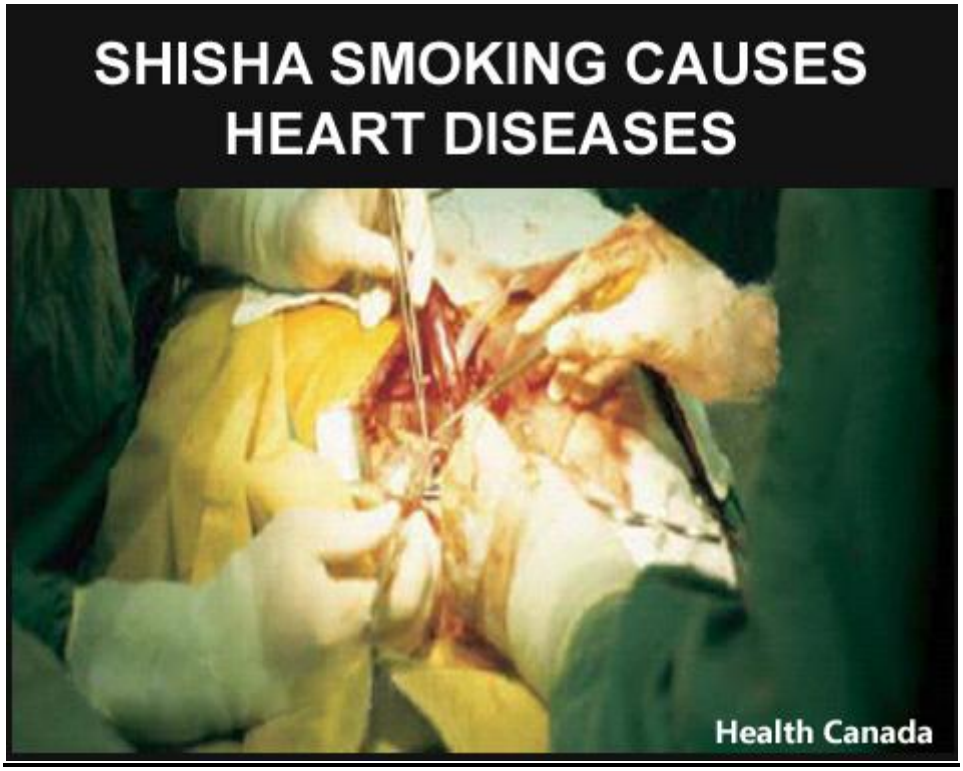
If you have any further questions, please feel free to contact us at the contact information provided to you.

Thanks and Good bye.

APPENDIX B: WARNING LABELS

GRAPHIC WARNING LABELS



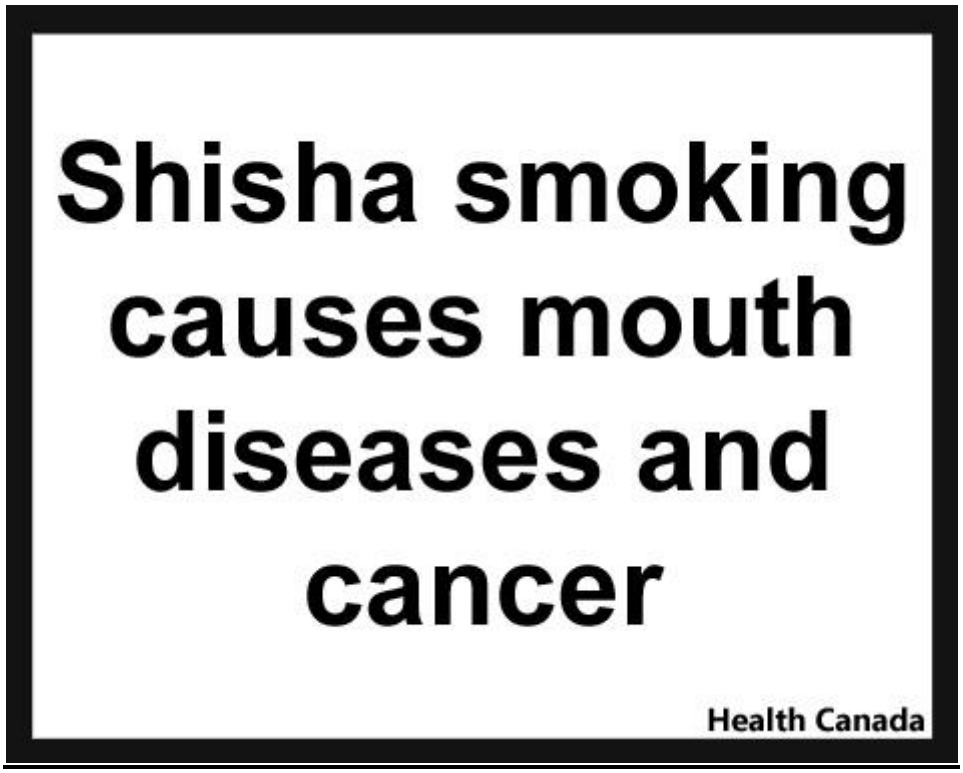

SHISHA SMOKING CAUSES
HEART DISEASES
Health Canada

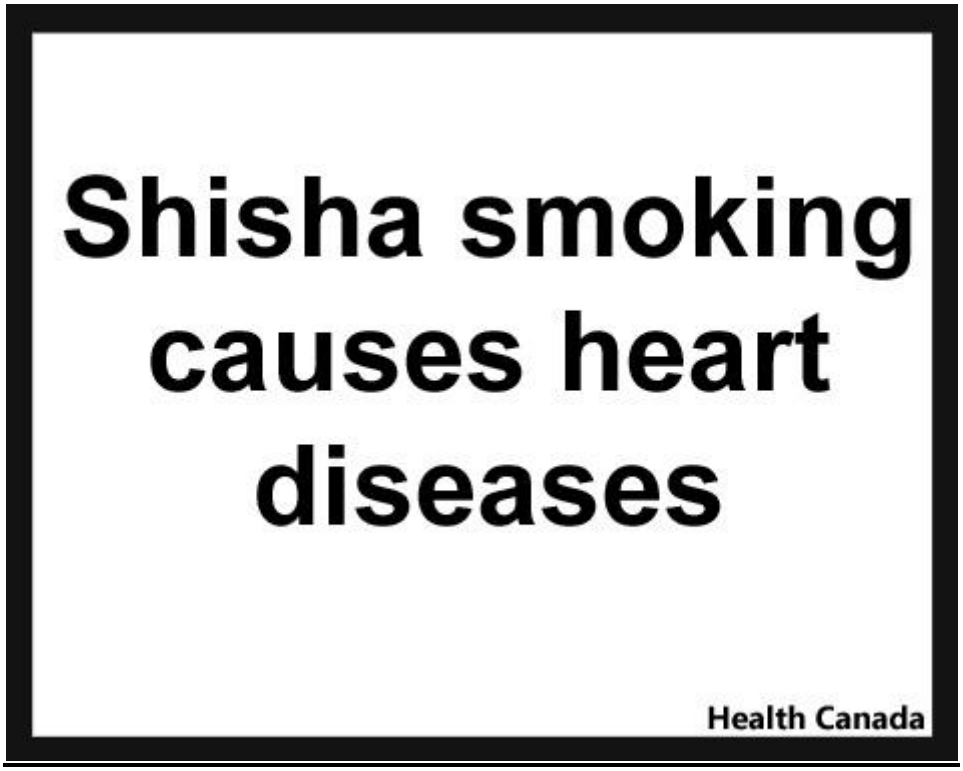

SHISHA SMOKING INCREASES
YOUR RISK OF STROKE
Health Canada

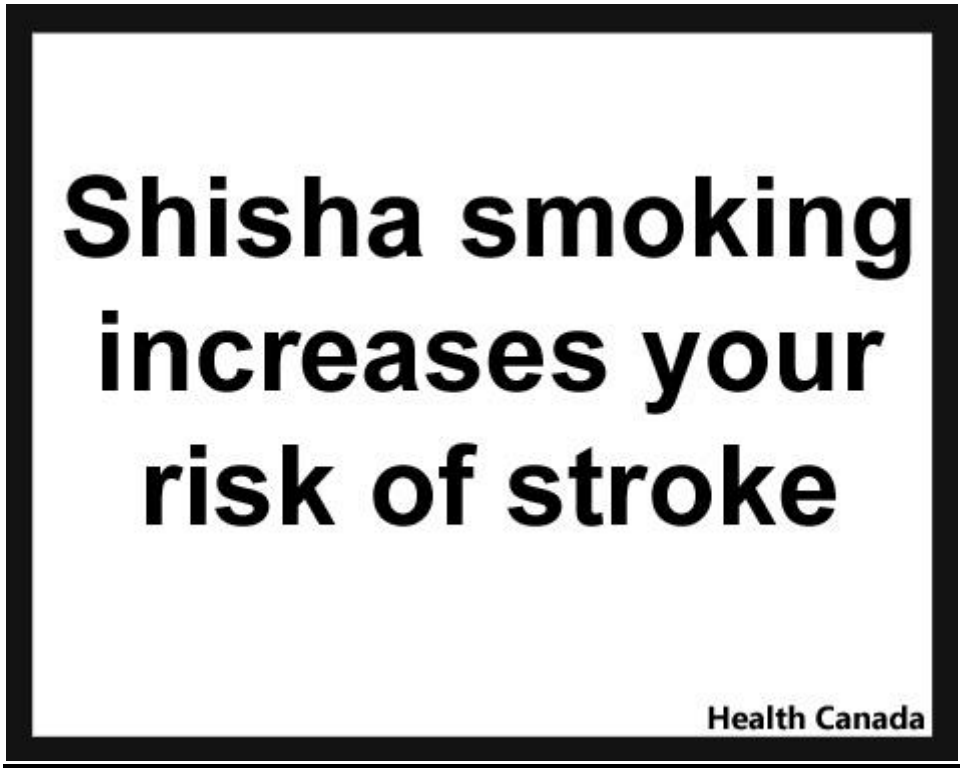

SHISHA SMOKING CAUSES LUNG DISEASES INCLUDING CANCER
Health Canada


DON'T LET OTHER PEOPLE BREATHE YOUR SHISHA SMOKE
Health Canada

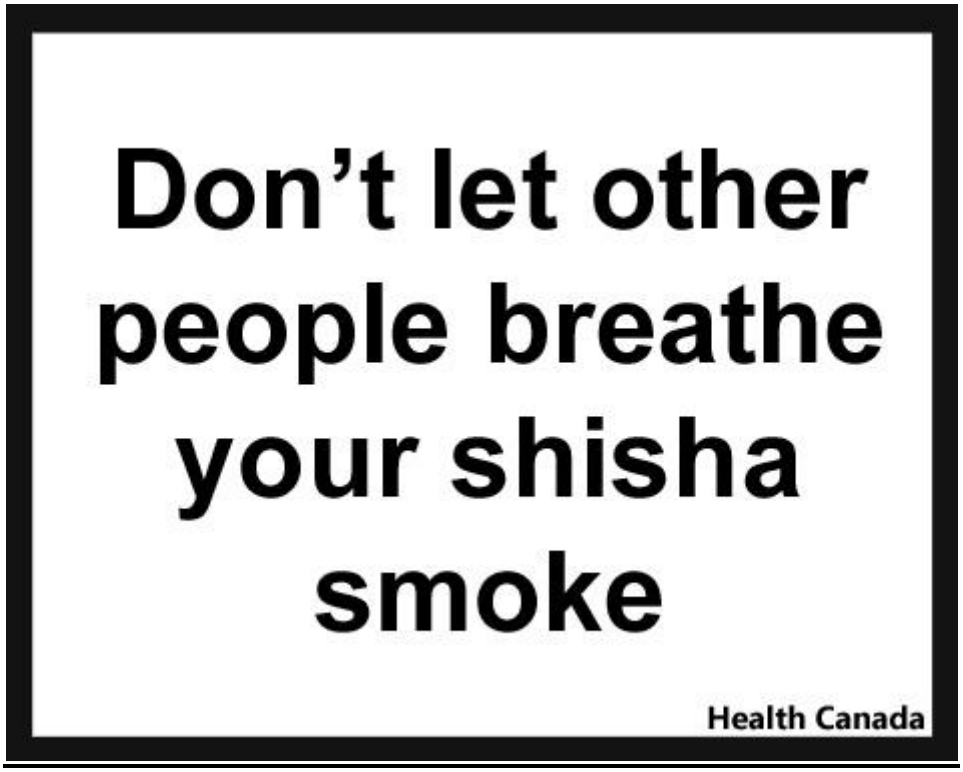
TEXT-ONLY WARNING LABELS



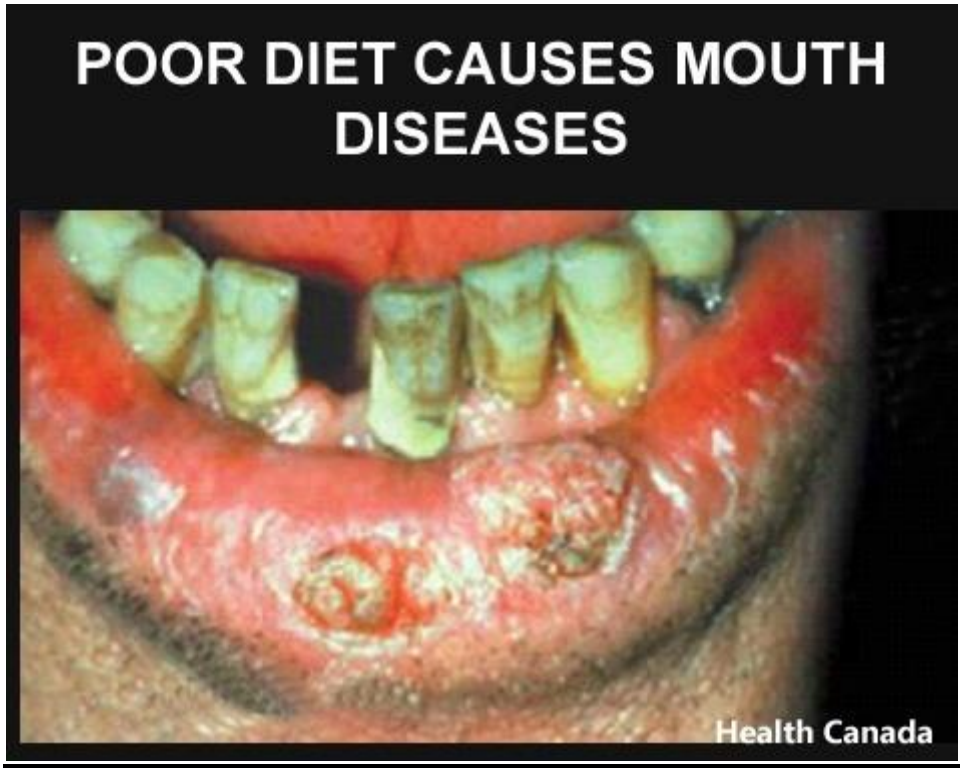

Shisha smoking causes heart diseases
Health Canada

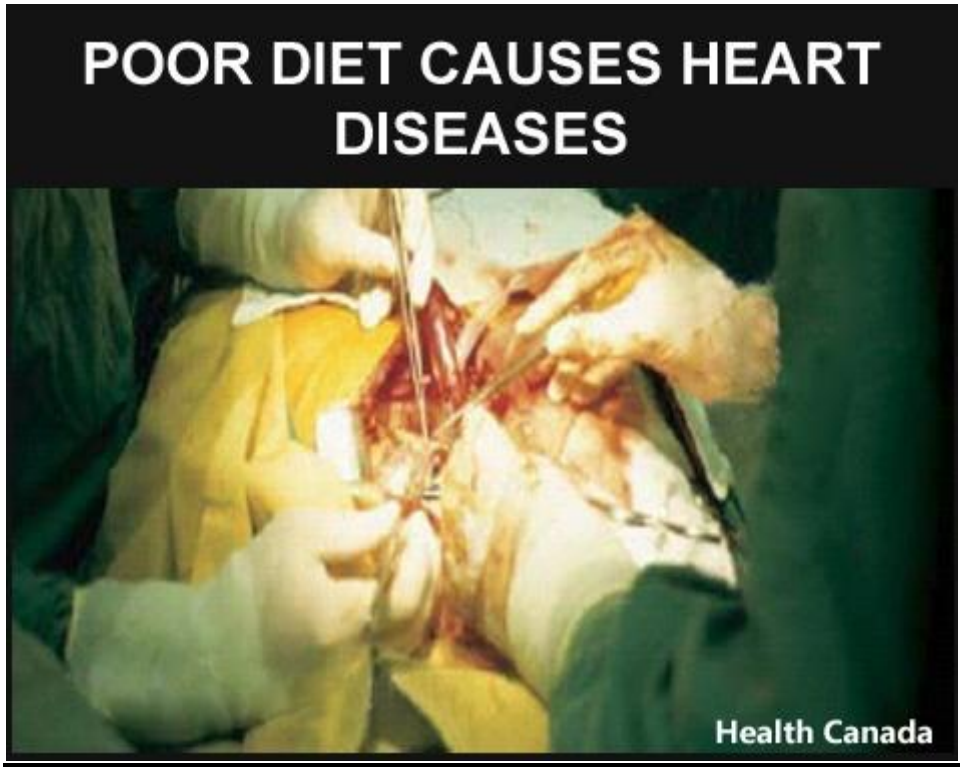

Shisha smoking increases your risk of stroke
Health Canada

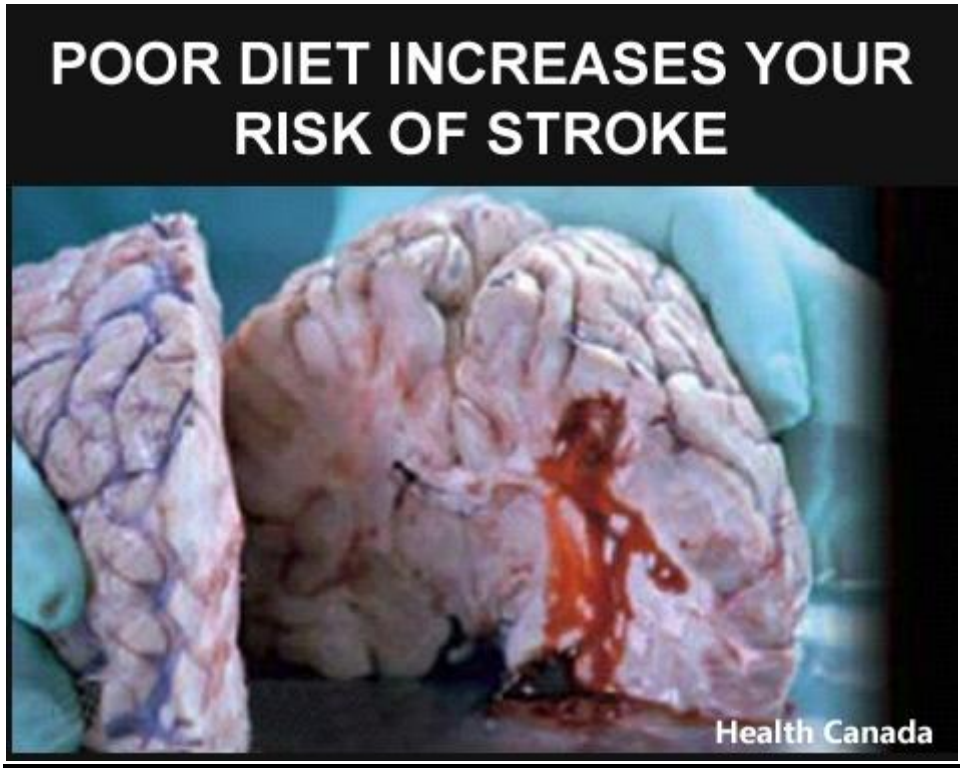

Shisha smoking causes lung diseases including cancer
Health Canada


Don’t let other people breathe your shisha smoke
Health Canada

NUTRITION LABELS




POOR DIET CAUSES HEART DISEASES
Health Canada


POOR DIET INCREASES YOUR RISK OF STROKE
Health Canada


POOR DIET INCREASES YOUR RISK OF LUNG DISEASES AND ASTHMA
Health Canada


POOR DIET SETS A BAD EXAMPLE
Health Canada

APPENDIX C: Complete script of online survey:

SHISHA USE-BASELINE
Computer script: Welcome and thank you for your interest in the Shisha Use Study! Please press "continue" to begin the study.
Before we begin: How old are you? _____ ➢ **If 18 +, continue**
Do you currently smoke any type of shisha (also called Hooka, water-pipe, or narghile) ? 1. Yes 2. No ➢ **If Yes, continue**
Can you read English?_____ 1. Yes 2. No ➢ **If Yes, continue**
If "No" to any of the above: Thank you! We appreciate your interest in the study. However, we can only conduct

the study with individuals who are shisha smokers, 18 years of age or older, and understands English. Thank you for your time."

If "Yes"

Thank you! You are now going to be provided with some information about the study. Please read the following information carefully, and once you understand the details of the study and agree to them, you can begin the survey.

Title of Project: **Impact of Health Warning Labels on Shisha Users**

Student Investigator: Heba Tallah Mohammed.

Dept. of Health Studies & Gerontology

University of Waterloo

(519) 888-4567, ext. 36631

Faculty Supervisor: Paul McDonald, Dept. of Health Studies & Gerontology

University of Waterloo

(519) 888-4567, ext. 35839

1. PURPOSE OF THIS RESEARCH STUDY

We are interested in examining the impact of tobacco warning labels on perceived susceptibility to and perceived severity of shisha smoking health hazards, on the motivation to quit, and on changing the pattern of shisha smoking.

2. PROCEDURES

In total, approximately 360 people will take part in the study. Participation involves completing two 30-minute online surveys. The first survey has two parts, while the second survey, completed two weeks later, has only one part.

During the first portion of survey 1, you will be asked some general questions about you and your smoking history, such as how much money you have to spend on shisha smoking every month, frequency of shisha smoking/week, patterns of shisha smoking, and your attitudes/beliefs about shisha smoking.

During the second portion of the survey1, you will be shown different health warning labels and asked to give ratings for each warning, such as how helpful were the warning labels in assisting you to quit, your emotional reactions to the messages, your knowledge on the risk of shisha smoking to health, and to what extent you believe the messages.

An e-mail message will be sent to you in 2 weeks to remind you about the second survey. If you decide to continue, you will complete survey 2 two weeks from today, it will take you approximately 20 minutes to complete. You will be asked questions about how much you think about warning labels, the effect of warning labels on the understanding of and attitude toward the health hazards caused by shisha smoking, the confidence in your ability to quit, intentions to quit, number of quit attempts, and any changes in the number or duration of shisha smoking.

All questions will appear on the computer screen and you will enter all responses on the computer.

You must be 18 years of age or older to participate in this study. Only shisha smokers can participate. Participation is voluntary and you may decline to answer particular questions if you wish.

By the end of each survey, you will receive a "Time Horton's" gift card mailed to your mailing address as an expression of appreciation for your time. You will be asked to provide your mailing address to receive it. It will be completely confidential; only the researchers in this study will have access to the information.

3. POSSIBLE RISKS OR DISCOMFORT

You will be asked to view six different health warning labels and then rate those warnings .These messages will contain the main health risks of unhealthy behaviour; the messages may contain graphic images, which may arouse feelings of discomfort, fear, and /or disgust. In the event that you develop any negative reactions, or are concerned that you may, please contact the researcher, ***Heba Tallah Mohammed*** at *htmohamm@uwaterloo.ca*.

4. POSSIBLE BENEFITS

Participation in the study is not expected to benefit you directly but you are taking part in a study that we think you will find interesting. This study has the potential to lay the foundation for additional research and policies requiring health warnings on shisha. Results of this study could contribute to establishing policies and priority actions in Canada and other countries for prevention of shisha smoking.

At the end of the study, we will be happy to answer any questions you may have. If

you smoke shisha and are interested in information on smoking cessation resources;

information about how to quit and a list of local organizations that provide services to help you quit will be available from the researcher, whose contact information is available above and will be provided again at the completion of the study.

You will also have the option of receiving the final results of the study, if you're interested. If you desire this information, we will keep your contact address in a separate file and mail out the results when the study is completed.

5. REMUNERATION

In appreciation of your time and any inconvenience, you will receive financial remuneration of $20 CAD in total ($10 following each survey) in the form of "Tim Horton's" gift cards. The gift card will be-mailed to your mailing address.

6. CONFIDENTIALITY

There are always concerns about keeping your privacy when you provide information about yourself , such as your smoking history. All information obtained in the study will be kept confidential. For your protection, we will assign you a code number that will be used to label all information. Any personal information, such as your contact information, will be kept in a separate file that will be locked away in our lab at the University of Waterloo and will be destroyed after the study is completed in approximately 1 year. Electronic copies of your data will not contain any personal identifiers and will be stored indefinitely on a password-protected computer in my supervisor's lab at the University of Waterloo. The online survey will be administered through the *Survey Research Centre* at the University of Waterloo and hosted on a secure site.

The results of the study may be published for scientific purposes but will not give your name or include information that will identify you.

7. WITHDRAWING FROM PARTICIPATION IN THE RESEARCH STUDY

You are free to choose whether or not to take part in this study. You can choose to stop being a part of the study at any time. To do so, you can proceed to the end of the survey by choosing the refusal option on each page and then following the instructions.You will still receive some remuneration ($10 CAD) for your time if you decide to withdraw after the first survey.

8. ETHICS REVIEW

This study has been reviewed by, and received ethics clearance, through the Office of Research Ethics at the University of Waterloo; however, the final decision about

participation is yours. Should you have any comments or concerns resulting from your involvement in this study, please contact Dr. Susan Sykes in the Office of Research Ethics at (519) 888-4567, ext.36005 or e-mail ssykes@uwaterloo.ca

9. AVAILABLE SOURCES OF INFORMATION

If you have any questions later on, or if you require additional information about the study, please feel free to contact the researcher listed below.

I agree to take part in this research study being conducted by Heba Tallah Mohammed, a PhD student in the Department of Health Studies at the University of Waterloo, under the supervision of Professor Paul McDonald.

I have made this decision based on the information I have read in the information letter. All the procedures and any risks and benefits relating to my participation have been explained. If I have questions about the study, I can contact the following researcher:

Heba Tallah Mohammed: (519) 888-4567, ext 36631 (office)

(Student Investigator) email: htmohamm@uwaterloo.ca

I understand that I may withdraw from the study at any time without penalty.

This project has been reviewed by, and received ethics clearance, through the Office of Research Ethics at the University of Waterloo. I am aware that I may contact Dr. Susan Sykes at (519-888-4567, ext. 36005) if I have any concerns or questions regarding my involvement in this study.

I agree to participate in this study:

Accept
Decline

Thank you! You are now ready to begin the survey. You will be given instructions as to how to complete each section of the survey. First, we are going to ask you some questions your shisha smoking behaviour and about yourself. Please be assured that

of all your responses will be kept entirely confidential. Please press "next" when you are ready to proceed.	
Tobacco Use	1. At what age did you start smoking shisha? _____
	2. Which of the following choices best describes your shisha smoking? 1. Usually, I smoke shisha monthly (at least once a month, but less than weekly) 2. Usually, I smoke shisha weekly (at least once a week, but less than daily) 3. Usually, I smoke shisha daily (at least once a day, or on most days of the month).
	3.On average, how many times did you smoke shisha in the last two weeks? 1. Less than once/week 2. Once/ week 3. Twice per week 4. 3-5 times /week 5. Almost every day 6. Cannot say/ Don't know.
	4.In the last two weeks, on average, how many sessions did you smoke in a day? 1. Less than one session 2. One session 3. 2-3 sessions 4. More than 3 sessions 5. Cannot say/ Don't know
	5. In the last two weeks, on average, how many hagar (s) do you smoke per session? (A hagar is an average portion of tobacco used in a waterpipe) 1. Less than one 2. One 3. 2-3 4. More than 3 5. Cannot say/ Don't know.

	6.In the last two weeks, on average, how long did the session typically last? 1. Less than 45 minutes 2. 45-60 minutes 3. 1-3 hours 4. More than 3 hours 5. Cannot say/ Don't know.
	7.In the last two weeks, what types of shisha did you use? 1. Flavoured shisha only. 2. Plain unflavoured shisha only. 3. Both. 4. Cannot say/Don't know
	8. In the last two weeks, where did you usually smoke shisha?(You may choose more than one option) 1. Coffee shop 2. Home 3. Restaurant 4. Other/specify _____
	9. In the last two weeks, who did you usually smoke shisha with?(You may choose more than one option) 1. Family 2. Friends 3. Alone 4. Other/specify _____ 5. Cannot say
	10. In the last two weeks, under what circumstances did you smoke shisha? (You may choose more than one option) 1. After eating 2. At social gathering 3. When stressed 4. When relaxed 5. Cannot say/ Don't know. 6. Other/specify _____

	11. Approximately, how much money did you spend on shisha in the last two weeks? _____
	12. Have you smoked 100 cigarettes, or more in your lifetime? 1. Yes 2. No 3. Cannot say/don't know
	13. Do you currently smoke cigarettes? 1. Yes 2. No If the answer is "No" skip to question # 15
	14. How often do you smoke cigarettes? 1. Every day 2. Less than every day
Knowledge, Health Beliefs, and Attitude	15. For each of the following statements please indicate whether you agree or disagree: a) Shisha smoking is dangerous to non- smokers. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know b) There is no medical evidence that shisha is harmful to your health. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know c) Shisha that is not flavoured is better for your health. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know d) Smoking shisha every once in a while does not damage your health. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know e)If you could start over again, you would not have started using shisha.

	1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know f) It is difficult to quit shisha smoking. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know g) Shisha should include health warning information like that on cigarette packages. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know
	16. How worried are you , if at all, that shisha smoking will damage your health in the future? 1. Not at all worried 2. A little worried 3. Moderately worried 4. Very worried 5. Cannot say/ Don't know.
	17. You will now be presented with a list of health effects and diseases that may or may not be caused by shisha smoking. Based on what you know or believe, does shisha smoking cause: a) Lung diseases including cancer? 1.Yes 2. No 3. Don't know a) Heart diseases? 1.Yes 2. No 3. Don't know c) Gum and mouth diseases including cancer? 1.Yes 2. No 3. Don't know d) Stroke and blood clots in the brain? 1.Yes 2. No 3. Don't know e) Emphysema? 1.Yes 2. No 3. Don't know f) Alzheimer's disease? 1.Yes 2. No 3. Don't know

	g) Bladder cancer? 1.Yes 2. No 3. Don't know h) Lung diseases in non-smokers from breathing the smoke? 1.Yes 2. No 3. Don't know i) Parkinson's disease? 1.Yes 2. No 3. Don't know j) Eye diseases and blindness? 1.Yes 2. No 3. Don't know
	18. Different people have different reasons for smoking shisha. Please indicate whether one (or more) of the following is (are) your reason(s) for smoking: a) You smoke shisha as a step to quit cigarette smoking completely. 1.Yes 2. No 3. Don't know c) You smoke shisha to reduce the risks of smoking without having to give up smoking. 1.Yes 2. No 3. Don't know c) You smoke shisha to reduce the tar you get from smoking cigarettes. 1.Yes 2. No 3. Don't know d) You smoke shisha to reduce the nicotine you get from smoking cigarettes. 1.Yes 2. No 3. Don't know e)You smoke shisha because you prefer the taste compared to cigarette smoking. 1.Yes 2. No 3. Don't know f) You smoke shisha because it gives you more appeal among your friends. 1.Yes 2. No 3. Don't know g) You smoke shisha to gather with your friends. 1.Yes 2. No 3. Don't know

Perception of Harm	19. What is your overall opinion of shisha smoking ? Is it: 1. Very good 2. Good 3. Neither good nor bad 4. Bad 5. Very bad 6. Cannot say
	20. What is your overall opinion of cigarette smoking? Is it: 1. Very good 2. Good 3. Neither good nor bad 4. Bad 5. Very bad 6. Cannot say
	21. Overall, how good or bad is shisha smoking for your health? 1. Very good 2. Good 3. Neither good nor bad 4. Bad 5. Very bad 6. Cannot say
	22. Overall, how good or bad is cigarette smoking for your health ? 1. Very good 2. Good 3. Neither good nor bad 4. Bad 5. Very bad 6. Cannot say
	23. Compared to cigarette smoking, do you think shisha is: 1. Less harmful to your health than cigarette smoking 2. About the same effect on your health as cigarette smoking 3. More harmful to your health than cigarette

	smoking 4. Cannot say/don't know
	24. Do you consider yourself addicted to shisha smoking? 1. Not at all 2. Somewhat 3. Very 4. Cannot say/ Don't know.
	25. In the last two weeks, how often, if at all, did you: b) Think about how much you enjoy shisha smoking? 1.Never 2. Sometimes 3. Often 4. Cannot say/Don't know b) Think about the harm your smoking might be causing your body? 1.Never 2. Sometimes 3. Often 4. Cannot say/Don't know c) Seriously consider quitting smoking shisha? 1.Never 2. Sometimes 3. Often 4. Cannot say/Don't know d) Think about the cost of shisha smoking? 1.Never 2. Sometimes 3. Often 4. Cannot say/Don't know
	26. In the last two weeks, how often have you thought about health warning labels on cigarette packages? 1. Never 2. Rarely 3. Sometimes 4. Often. 5. Very often. 6. Cannot say/ Don't know.
	27. In the last two weeks, how often, if at all, have you talked about one or more of the warning labels with others (smokers or non-smokers)? 1. Never 2. Rarely 3. Sometimes

	4. Often. 5. Very often. 6. Cannot say/ Don't know.
	28. To what extent do you agree or disagree with the following statement: In the last two weeks I tried my best to avoid thinking about tobacco warning labels 1. Strongly disagree 2. Somewhat disagree 3. Neutral 4. Somewhat agree 5. Strongly agree
Perceived Behavioural Control and Quit Intentions:	29. Do you intend to quit shisha smoking? 1. Not at all 2. In the next month 3. In the next 6 months 4. More than 6 months from now 5. Cannot say/ Don't know.
	30. How easy or difficult do you think it might be to permanently quit using shisha? 1. Very easy 2. Somewhat easy 3. Somewhat difficult 4. Very difficult 5. Don't know
	31. In the last two weeks, have you ever stopped smoking shisha before you finish the (hagar) because you thought about the harm of smoking? 1. Yes 2. No 3. Not sure
	32. In the last two weeks, how often, if at all, have you been tempted to smoke shisha but decided not to? 1. Never 2. Once 3. A few times

	4. Many times. 5. Cannot say/ Don't know. 6.
	33. In the last two weeks, have you tried to stop shisha smoking? 1. No 2. Once 3. More than once 4. Don't know/can't say
	Thank you! You are now going to be shown a series of six warning labels. For each warning label you see, please take a moment to look at the label, and then you will be asked several questions for each. After you have answered each question, please press "next" to continue.

Tobacco Warning labels	Please look closely at the presented warning and answer whether this warning message:
	a)…… grabs your attention 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	b)….. is believable 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	c) …..is understandable 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	d) ……is relevant to you

	1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	e) ……is surprising 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	f).....is frightening 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	g).....is disgusting 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	h).....is unpleasant 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	i).....would make people more concerned about the health risks of smoking 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely

	j) …..would help prevent young people from starting to smoke 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	k)….. would make smokers want to quit 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely l) …..would make smokers want to smoke now 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	Overall, on a scale of 1 to 10, how effective is this health warning? 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	Overall, on a scale of 1 to 10, how does the warning label make you think and feel about shisha smoking? 1 2 3 4 5 6 7 8 9 10 Extremely negative In the Middle Extremely positive
	Overall, on a scale of 1 to 10, how accurately do you feel the warning depict the risks to your health? 1 2 3 4 5 6 7 8 9 10 Very inaccurately In the Middle Very accurately
Nutrition Warning labels	Please look closely at the presented warning and answer whether this warning message

	a)..... grabs your attention 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	b).....is believable 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	c)……is understandable 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	d) …..is relevant to you 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	e).....is surprising 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	f) ……is frightening 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	g).....is disgusting

	1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	h).....is unpleasant 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	i).....would make people more concerned about the health risk of unhealthy eating 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	j).....would help prevent people from eating an unhealthy diet 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	k)..... would make people change their diet 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	l)..... would make people want to eat unhealthy food now 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely
	Overall, on a scale of 1 to 10, how effective is this health warning? 1 2 3 4 5 6 7 8 9 10 Not at all In the Middle Extremely

	Overall, on a scale of 1 to 10, how does the warning label make you think and feel about eating an unhealthy diet? 1 2 3 4 5 6 7 8 9 10 Extremely negative In the Middle Extremely positive
	Overall, on a scale of 1 to 10, how accurately do you feel the warning depicts the risks to your health? 1 2 3 4 5 6 7 8 9 10 Very inaccurately In the Middle Very accurately
	Thank you! Now we are going to ask you some general questions about yourself.
Demographic	34. What is your gender? 1. Male 2. Female 3. Prefer not to say
	35. What is the highest level of education you have completed? 1. Some elementary school or less 2. Some high school 3. Completed high school 4. Some college or university 5. Completed college or university 6. Graduate or professional school (e.g. MSc, MBA, PhD) 7. Prefer not to say
	36.What is your current employment status? 1. Working full-time (35 or more hours per week) 2. Working part-time (less than 35 hours per week) 3. Self-employed 4. Currently unemployed, but looking for work 5. Student 6. Retired 7. Not in workforce (Homemaker/Unemployed, not looking for

	work) 8. Other/prefer not to say
	37.What is your current household income, **before** taxes? 1. Below $10,000 2. $10,000 to $19,999 3. $20,000 to $29,999 4. $30,000 to $39,999 5. $40,000 to $49,999 6. $50,000 to $59,999 7. $60,000 to $69,999 8. $70,000 to $79,999 9. $80,000 to $99,999 10. $100,000 and above 11. Prefer not to say
	38. What is your current marital status? 1. Single/Never married 2. Married/Common-law 3. Divorced/Separated 4. Widowed 5. Prefer not to say
	39. Which of the following best describes your racial or ethnic background? 1. White/Caucasian 2. Black 3. Asian 4. European 5. Middle-Eastern 6. Mixed 7. Other 8. Prefer not to say
	40.In general, how would you rate your overall health? 1. Poor 2. Fair 3. Good 4. Very Good 5. Excellent 6. Prefer not to say
Thank you, you have finished the first survey of our study! **An e-mail message will be sent to you in 2 weeks to remind you about the second survey. The e-mail will include the link to the survey and the login access code. To complete the second survey, please login in the recommended date (which will be automatically**	

provided). We appreciate your participation in our study and thank you for spending the time helping us with our research.

SHISHA USE: FOLLOW-UP

Thank you for joining the second survey of our study!

1. PURPOSE OF THE STUDY

As a reminder, our study examines the impact of warning labels on your beliefs about shisha smoking and your knowledge of the health risks and any impact on smoking behaviour.

2. PROCEDURES:

In total, approximately 360 people will take part in the study. In survey 2 of our study, you will be asked questions about how much you think about warning labels, the effect of warning labels on awareness, knowledge, and beliefs about health risks that may be caused by shisha smoking and any impact on smoking behaviour. The survey will take approximately 20 minutes.

All questions will appear on the computer screen and you will enter all responses on the computer.

You must be 18 years of age or older to participate in this study. Only shisha smokers can participate. Participation is voluntary and you may decline to answer particular questions if you wish.

By the end of each survey, a "Time Horton's" gift card will be-mailed to your mailing address as an expression of appreciation for your time. You will be asked to provide your mailing address to receive it. It will be completely confidential; only the researchers in this study will have access to the information.

3. POSSIBLE RISKS OR DISCOMFORT

There is no possible risk to participation in survey 2 of the study.

4. POSSIBLE BENEFITS

Participation in the study is not expected to benefit you directly but you are taking part in a study that we think you will find interesting. This study has the potential to lay the foundation for additional research and policies requiring health warnings on shisha. Results of this study could contribute to establishing policies and priority actions in Canada and other countries for prevention of shisha smoking.

At the end of the study, we will be happy to answer any questions you may have. If you smoke shisha and are interested in information on smoking cessation resources; information about how to quit and a list of local organizations that provide services to help you quit will be available from the researcher, whose contact information is available above and will be provided again at the completion of the study.

You will also have the option of receiving the final results of the study; if you're interested. If you desire this information, we will keep your contact address in a separate file and mail out the results when the study is completed.

5. REMUNERATION

In appreciation of your time and any inconvenience, you will receive financial remuneration of $10 CAD in the form of "Tim Horton's" gift card. The gift card will be-mailed to your mailing address.

6. CONFIDENTIALITY

There are always concerns about keeping your privacy when you provide information about yourself , such as your smoking history. All information obtained in the study will be kept confidential. For your protection, we will assign you a code number that will be used to label all information. Any personal information, such as your contact information, will be kept in a separate file that will be locked away in our lab at the University of Waterloo and will be destroyed after the study is completed in approximately 1 year. Electronic copies of your data will not contain any personal identifiers and will be stored indefinitely on a password-protected computer in my supervisor's lab at the University of Waterloo. The online survey will be administered through the *Survey Research Centre* at the University of Waterloo and hosted on a secure site.

The results of the study may be published for scientific purposes but will not give your name or include information that will identify you.

7. WITHDRAWING FROM PARTICIPATION IN THE RESEARCH STUDY

You are free to choose whether or not to take part in this study. You can choose to stop being a part of the study at any time. To do so, you can proceed to the end of the survey by choosing the refusal option on each page and then following the instructions.You will still receive some remuneration ($10 CAD) for your time if you decide to withdraw from the

second survey.

8. ETHICS REVIEW

This study has been reviewed by, and received ethics clearance, through the Office of Research Ethics at the University of Waterloo; however, the final decision about participation is yours. Should you have any comments or concerns resulting from your involvement in this study, please contact Dr. Susan Sykes in the Office of Research Ethics at (519) 888-4567, ext. 36005 or e-mail ssykes@uwaterloo.ca

9. AVAILABLE SOURCES OF INFORMATION

If you have any questions later on, or if you require additional information about the study, please feel free to contact the researcher listed below.

I agree to take part in this research study being conducted by Heba Tallah Mohammed, a PhD student in the Department of Health Studies and Gerontology at the University of Waterloo, under the supervision of Professor Paul McDonald.

I have made this decision based on the information I have read in the information letter. All the procedures and any risks and benefits relating to my participation have been explained. If I have questions about the study, I can contact the following researcher:

Heba Tallah Mohammed: (519) 888-4567, ext 36631 (office)

(Student Investigator) email: htmohamm@uwaterloo.ca

I understand that I may withdraw from the study at any time without penalty.

This project has been reviewed by, and received ethics clearance, through the Office of Research Ethics at the University of Waterloo. I am aware that I may contact Dr. Susan Sykes at (519-888-4567, ext. 36005) if I have any concerns or questions regarding my involvement in this study.

I agree to participate in this study:

Accept
Decline

Thank you! You are now ready to begin the second survey. You will be given instructions as to how to complete each section of the survey. First, we are going to ask you some questions about your shisha smoking behaviour. Please be assured that all of your responses will be kept entirely confidential. Please press "next" when you are ready to proceed.	
Tobacco Use	1. On average, how many times did you smoke shisha in the last two weeks? 1. Less than once/week 2. Once/ week 3. Twice per week 4. 3-5 times /week 5. Almost every day 6. Cannot say/ Don't know.
	2. On average, how many sessions did you smoke in a day in the last two weeks? 1. Less than one 2. One 3. 2-3 4. More than 3 5. Cannot say/ Don't know
	3. In the last two weeks, on average, how many hagar(s) did you smoke per session? 1. Less than one 2. One 3. 2-3 4. More than 3 5. Cannot say/ Don't know.
	4. In the last two weeks, on average, how long did the session last? 1. Less than 45 minutes 2. 45-60 minutes 3. 1-3 hours 4. More than 3 hours 5. Cannot say/ Don't know.
	5. In the last two weeks, what type(s) of shisha did you use? 1. Flavoured shisha only 2. Plain unflavoured shisha only 3. Both 4. Cannot say/ Don't know.
	6. In the last two weeks, how often did you smoke the flavored one? 1. Never

	2. Sometimes 3. Often 4. Cannot say/ Don't know.
	7. In the last two weeks, where did you usually smoke shisha?(You may choose more than one option) 5. Coffee shop 6. Home 7. Restaurant 8. Other/specify _____
	8. In the last two weeks, who did you usually smoke shisha with? (You may choose more than one option) 6. Family 7. Friends 8. Alone 9. Other/specify _____ 10. Cannot say
	9. In the last two weeks, under what circumstances did you smoke shisha? (You may choose more than one option) 7. After eating 8. At social gathering 9. When stressed 10. When relaxed 11. Cannot say/ Don't know. 12. Other/specify _____
	10. Approximately, how much money did you spend on shisha in the last two weeks ? _____
Knowledge, Health beliefs & Attitude	11. For each of the following statements please indicate whether you agree or disagree: a) Shisha smoking is dangerous to non-smokers**.** 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know b) There is no medical evidence that shisha is harmful to your health. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know c) Shisha that is not flavoured is better for your health. 1.Agree 2. Neither agree nor disagree 3. Disagree

	4. Cannot say/don't know d) Smoking shisha every once in a while does not damage your health. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know e) If you could start over again, you would not have started using shisha. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know f) It is difficult to quit shisha smoking. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know g) Shisha should include health warning information like that on cigarette packages. 1.Agree 2. Neither agree nor disagree 3. Disagree 4. Cannot say/don't know
	12. How worried are you , if at all, that shisha smoking will damage your health in the future? 1. Not at all worried 2. A little worried 3. Moderately worried 4. Very worried 5. Cannot say/don't know
	13. You will now be presented with a list of health effects and diseases that may or may not be caused by shisha smoking. Based on what you know or believe, does shisha smoking cause: a) Lung diseases including cancer? 1.Yes 2. No 3. Don't know c) Heart diseases? 1.Yes 2. No 3. Don't know c) Gum and mouth diseases including cancer? 1.Yes 2. No 3. Don't know g) Stroke and blood clots in the brain?

	1.Yes 2. No 3. Don't know h) Emphysema? 1.Yes 2. No 3. Don't know i) Alzheimer's disease? 1.Yes 2. No 3. Don't know g) Bladder cancer? 1.Yes 2. No 3. Don't know h) Lung diseases in non-smokers from breathing the smoke? 1.Yes 2. No 3. Don't know i) Parkinson's disease? 1.Yes 2. No 3. Don't know j) Eye diseases and blindness? 1.Yes 2. No 3. Don't know
Perception of Harm	14. What is your overall opinion of the habit of shisha smoking ? Is it: 1. Very good 2. Good 3. Neither good nor bad 4. Bad 5. Very bad 6. Cannot say
	15. Overall, how good or bad is shisha smoking for your health ? 1. Very good 2. Good 3. Neither good nor bad 4. Bad 5. Very bad
	16. Compared to cigarette smoking, do you think shisha is? 1. Less harmful to your health than cigarette smoking 2. About the same effect on your health as cigarette smoking 3. More harmful to your health than cigarette smoking 4. Cannot say/don't know
	17. In the last two weeks, how often, if at all, did you a) Think about how much you enjoy shisha smoking? 1.Never 2. Sometimes 3. Often 4. Cannot say/Don't know

	b) Think about the harm your smoking might be causing you? 1.Never 2. Sometimes 3. Often 4. Cannot say/Don't know c) Seriously consider quitting smoking? 1.Never 2. Sometimes 3. Often 4. Cannot say/Don't know d) Think about the cost of shisha smoking? 1.Never 2. Sometimes 3. Often 4. Cannot say/Don't know
	18. In the last two weeks, how often have you thought about the health warning labels you viewed in this study? 1. Never 2. Rarely 3. Sometimes 4. Often. 5. Very often. 6. Cannot say/don't know
	19. In the last two weeks, how often, if at all, have you talked about one or more of the warning labels that you viewed in this study with others (smokers or non-smokers)? 1. Never 2. Rarely 3. Sometimes 4. Often. 5. Very often. 6. Cannot say/don't know
	20. To what extent do you agree or disagree with the following statement: In the last two weeks I tried my best to avoid thinking about the viewed warning labels in this study 1. Strongly disagree 2. Somewhat disagree 3. Neutral 4. Somewhat agree. 5. Strongly agree.
	21. Did viewing the warning labels make you think: 1. A lot more about the health effects of shisha smoking 2. Think a little more 3. Have they had no impact how much you think about the health effects of shisha smoking 4. Think a lot less. 5. Think a little less

Perceived Behavioural Control & Quit Intentions:	22. Do you intend to quit shisha smoking? 1. Not at all 2. In the next month 3. In the next 6 months 4. More than 6 months from now 5. Cannot say/don't know
	23. How easy or difficult do you think it might be to permanently quit using shisha? 1. Very easy 2. Somewhat easy 3. Somewhat difficult 4. Very difficult 5. Don't know
	24. In the last two weeks, have you ever stopped smoking shisha before you finish the (hagar) because you thought about the harm of smoking? 1. Yes 2. No 3. Not sure
	25. In the last two weeks, have you made any attempts to stop shisha smoking since we last talked with you? 1. No 2. Once 3. More than once 4. Don't know/can't say
	26. How have the viewed warnings affected the likelihood that you will quit smoking within the next year? 1. A lot less likely to quit because of the labels 2. Somewhat less likely to quit because of the labels 3. No difference 4. Somewhat more likely to quit because of the labels 5. A lot more likely to quit 6. Cannot say/don't know
	27. How confident are you now in your ability to quit shisha smoking? 1. Not confident at all 2. A little confident 3. Moderately confident 4. Very confident 5. Cannot say/don't know

	28. In the last two weeks, how often, if at all, have you been tempted to smoke shisha but decided not to? 1. Never 2. Once 3. A few times 4. Many times 5. Don't know/can't say
	29. In the last two weeks, have you ever stopped smoking shisha before you finish the (hagar) because you thought about the harm of smoking ? 1. Yes 2. No 3. Not sure
	30. In the last two weeks, have you stopped from smoking shisha when you were about to smoke one? 1. Never 2. Once in a while 3. Many times 4. Don't know/can't say
	31. In the last two weeks, have the warnings made you smoke shisha: 1. A lot less 2. A little less 3. No difference 4. A little more 5. A lot more
Recall	32. I'm now going to ask you a question about your memory of the health warnings that you viewed and rated two weeks ago. In total there were 6 health warnings. I'd like you to take a minute and try and recall these health warnings: you can either type the words of the warnings or provide a brief description of any warnings you can remember. It is okay if you can't recall all the health warnings but please try your best. _____
You finished the survey! We appreciate your participation in our study, and thank you for spending the time helping us with our research.	

Feedback letter:

I would like to thank you for your participation in this study. As a reminder, we are interested in the impact of warning labels on shisha use . For the current study, we were particularly interested in the impact of warning labels and how they affect perceptions of potential health risk, as well as perceptions of appeal. We were also interested in the impact of these warnings on beliefs about the risks of shisha smoking, beliefs ,and general attitudes towards smoking, on the motivation to quit, and on changing patterns of shisha smoking. Different groups of participants were shown different types of health warning labels: whereas some participants were shown “text-only” tobacco health warnings, others were shown nutrition or tobacco "graphic and text" warnings. We will compare responses from the different groups to see whether the type of warnings affect participants' attitudes towards shisha smoking.

As a reminder, all the information you provided during the survey will be kept strictly confidential. This project has been reviewed by, and received ethics clearance, through the Office of Research Ethics at the University of Waterloo. Should you have any questions or concerns about your participation in this study, please contact myself or Dr. Susan Sykes, Director, Office of Research Ethics at the University of Waterloo, at 519-888-4567, ext. 36005 or by e-mail at ssykes@uwaterloo.ca.

If you would like any further information about the study, including a copy of our findings when they become available, please contact us at the contact information below. Also, we would be happy to provide you with a list of smoking cessation resources should you wish.

Thank you again for your help.

Sincerely,

Heba Tallah Mohammed
Dept. of Health Studies, University of Waterloo

Tel: (519) 888-4567 ext. 36631

Email: htmohamm@uwaterloo.ca

[END SURVEY]