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Authors' Affiliation:
[1]Assistant Professor, College of Medicine, Tabuk University, Tabuk, Saudi Arabia
[2]Medical Student, College of Medicine, Tabuk University, Tabuk, Saudi Arabia

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Cardiovascular disease risk factors among medical students at Tabuk University, Saudi Arabia during COVID-19 quarantine

Tariq Alrasheed[1], **Abdulaziz Alwakeel**[2], **Mahmoud Alarki**[2], **Amira Alkonani**[2], **Raghad Albalawi**[2], **Mariam Shaman**[2], **Waseem Almalawi**[2], **Sumayah Alenezi**[2]

ABSTRACT

Background: The pandemic, brought on by the novel coronavirus disease (COVID-19) has affected the global population, many countries worldwide, including Saudi Arabia, imposed quarantine measures. Living in quarantine limited daily activities and increased sedentary behavior, which could increase coronary disease risk factor. To assess the relationship between quarantine and CVD Risk-Factors Among Medical Students at Tabuk University, Saudi Arabia. *Methods:* This is a cross-sectional observational study to be carried out at Tabuk University, Tabuk city, Saudi Arabia during the year 2022. A total of 255 medical students who were quarantined during the pandemic are considering in this study. A structured questionnaire was used to collect socio-demographic data, dietary patterns, actual work, sleep and smoking. All these were asked twice, once in regard to the period before the pandemic (pre-COVID-19) and the other in regard to the period during lockdown (quarantine) (during COVID-19). The SPSS was used to assess the prevalence of CVD risk-factor during quarantine between medical students. *Results:* The study included 279 participants, 62.7% were females and 37.3% were males. 93.2% of participants aged 18- 25 years old. 97.5% of participants were single. 22.4% were in the fourth academic year, 24.7% in the fifth year and 17.9% were in the sixth year. Health and weight status among participants 22.6% of participants stated their weight was that their weight was decreased during quarantine, 39.4% reported increase in weight and 27.2% reported weight stability. *Conclusion:* COVID-19 Quarantine time raised the risk of CVD in our sampled research participants as physical activity reduced and sedentary behavior rose.

Keywords: Cardiovascular disease risk factor, COVID 19 pandemic, Quarantine, Tabuk University, Tabuk, Saudi Arabia

1. INTRODUCTION

The novel coronavirus disease (COVID-19) pandemic has brought numerous new problems and changes to human life worldwide, wreaking havoc on people's health, lifestyles and social lives, as well as the local and global economy (Ismail et al., 2020). The World Health Organization declared it a worldwide pandemic on March 11, 2020 after it first appeared in the Chinese city of Wuhan in December 2019 and spread worldwide in the following months (Ismail et al., 2020). By July 28, 2020, the virus had affected over 203 countries, areas or territories, with over 16,670,063 people infected and nearly 659,077 deaths reported (Alamri et al., 2020).

The first case in Saudi Arabia was discovered on March 2, 2020 and since then, the number of cases has risen rapidly (Alamri et al., 2020). Educational institutes (schools and colleges), commercial areas, restaurants, beaches and resorts were closed from April 13, 2020 and a 24-h curfew was imposed in numerous Saudi Arabian towns (Alamri et al., 2020). Residents were allowed to leave their houses between 6 am and 3 pm for needs, such as food and prescriptions, as long as they stayed within the confines of their living area and had only one passenger per car (Alamri et al., 2020).

The term "quarantine" is used in public health to describe the separation of people who have been exposed to an infectious disease. In contrast, "isolation" refers to the separation of those who are known to be infected. The current COVID-19 pandemic has prompted governments in the most affected countries to impose strict lock-down precautionary measures on their citizens (Alfawaz et al., 2021). These measures included working from home and closing shops, schools, restaurants and other non-essential services or businesses to slow the spread of the disease and to avert the collapse of the healthcare system. Quarantine has certain long-term effects on cardiovascular disease (CVD), which are primarily due to poor lifestyle choices (Ismail et al., 2020).

In both industrialized and developing countries, CVD is a major cause of death (Xu et al., 2015). In 2009, the cost of coronary heart disease (CHD) and stroke in the United States was estimated at $234 billion (Alamri et al., 2020). Although the prevalence of CVD risk factors has reduced in some developed countries, it has risen in developing countries (Alamri et al., 2020). Many non-communicable diseases (NCD s) can be avoided if risk factors are avoided (Gutierrez et al., 2018). CVD is the leading cause of death in the world and according to the Canadian Heart and Stroke Foundation, significant risk factors include age, sex, family history, cigarette smoking, physical inactivity, poor diet and obesity; therefore, reducing the prevalence of CVD-specific behavioral risk factors can help with prevention (Gutierrez et al., 2018; Issa et al., 2022; Ahmadjee et al., 2022).

NCDs were responsible for 39.5 million deaths in 2015; of the 56.4 million deaths worldwide, CVD alone was responsible for 17.7 million fatalities (Gutierrez et al., 2018). Furthermore, NCDs claimed the lives of nearly 30.7 million people in poor and middle-income countries, accounting for approximately three-quarters of all deaths (Gutierrez et al., 2018).

In April 2020, a study was conducted to assess the effect of the lockdown on eating habits and lifestyle behaviors among residents of the United Arab Emirates. The study enrolled a total of 1,012 participants. During the epidemic, 31% of people gained weight and 72.2% drank less than eight-glasses of water each-day. Furthermore, the individuals' eating patterns were less aligned with Mediterranean diet principles and more aligned with “unhealthy” eating patterns. Additionally, 36.2 percent watched more than 5h of television each day and 38.5percent weren't involved in any physical-activity. The results of this study performed majorly outside the city of Tabuk in Saudi Arabia were similar to those obtained from other studies performed outside the Kingdom of Saudi Arabia. Also, smoking history was not considered in the study.

On April 10, 2018, a cross-sectional study was conducted to assess the prevalence of CVD risk factors and their associations among the Tabuk City population in Saudi Arabia, with the following results: Diabetes mellitus (DM) was present in 5.6% of the population, hypertension (HTN) was present in 11.1% and 69.9% of the population was found to be obese or overweight. Body mass index (BMI), HTN and DM increased with age. BMI and HTN were shown to be correlated (Gutierrez et al., 2018). This study was conducted before the COVID19 pandemic and the sample size included the entire population of Tabuk, which was very broad compared with that in our study, which considered only medical students at the University of Tabuk.

Another cross-sectional study was conducted among fourth to sixth year students of a medical school, to determine the prevalence of CHD risk-factors among medical-students and the study's findings focusing on the most frequent risk factors for CHD revealed that 73.4% of the students were on a high fat diet, 57.9% were inactive and 31.2% were overweight or obese (13.1%) (Ibrahim et al., 2014). Other significant risk factors were hypercholesterolemia (17.2%) and hypertension (9.3%) (Ibrahim et al., 2014). The prevalence of smoking was low (2.8%) (Ibrahim et al., 2014). In general, men exhibited significantly higher CHD risk factors than women. The systolic blood pressure of males was also comparatively higher than that of females (Ibrahim et al., 2014).

Study Rationale

Most of the studies similar to ours have been performed outside the Kingdom of Saudi Arabia, specifically outside the city of Tabuk. In addition, the sample population used in our research is medical students at the University of Tabuk, for which no one has

previously published research. The time period chosen for our research was the COVID-19 quarantine period, to determine if the quarantine had an impact on the health of students of the Faculty of Medicine at the University of Tabuk.

Research Objective

The general objective is to determine the prevalence of RF for CVD among medical students at Tabuk University in Tabuk, Saudi Arabia, during the quarantine of the COVID-19 outbreak. There are CVD risk factors among clinical students at Tabuk University, Saudi Arabia during the COVID-19 quarantine.

Research question

Are there risk factors for CVDs among medical students at Tabuk University during the COVID-19 quarantine period?

2. METHODOLOGY

Study design

This is a cross-sectional observational study was done during the year 2022 in Tabuk city, Kingdom of Saudi Arabia

Study population

All students under graduation at the Faculty of Medicine, University of Tabuk

Inclusion and exclusion criteria

The Inclusion criteria of this study: Age <18 year, male and female sex, medical student at Tabuk university, agree to participate and undergraduate. Therefor the exclusion criteria: Age <18 years, postgraduate, not medical student and refusing to participate

Sample size

A sample size of 255 was estimated using the Qualtrics calculator, with a confidence level of 95%

Sampling technique

Simple random sampling method

Method for data collection and instrumentation

The method for data collection and instrumentation was a self-administered online review using Google-document forms in Arabic. The survey has been developed by the researchers based on a substantial body of prior relevant literature to achieve the research objectives (Caponnetto et al., 2020; Ismail et al., 2020). The tool is a questionnaire on dietary and lifestyle propensities (smoking, eating habits, physical activity and sleeping habit) before and during the COVID-19 restriction. The online questionnaire includes 27 questions and is divided into five categories: (1) bio-social baseline (7 inquiries): Sex, age, marital-status, children number, academic-year, employment status (regardless of whether they were working or concentrating from home-during the lock-down) and weight change; (2) dietary patterns (7 inquiries): Meal frequency, meal type, breakfast consumption, skipping-meals, reasons for skipping-meals, water consumption and frequency of intake of specific foods; (3) active work (4 inquiries): Exercise frequency, home duties frequency, screen time for work or study and screen time for pleasure; (4) smoking habits (5 inquiries): Previous and present smoking status, changes in utilization, major changes in the method of buying, considerations about stopping, the danger of backslide among previous smokers and the danger of beginning smoking in the individuals who had never smoked; (5) sleep habits (4 inquiries): Duration of sleep, the quality of sleep, sleep disruptions and the degree of energy during the day.

Inquiries on dietary patterns, actual work, sleep and smoking was asked twice, once in regard to the pre-pandemic-COVID19 phase and the other with respect to the lock-down period during-COVID19. Ethical approval was obtained from the Research Ethical Committee at Faculty of Medicine in Tabuk University, Tabuk City, Saudi Arabia (Ethical approval number: UT-194-53-2022).

Analyses and Entry Methods

Data was entered on a computer using the "Microsoft Office Excel Software" program (2016) for Windows. The data was transferred to the Statistical Package of the Social Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0 Armonk, NY, IBM Corp.) for statistical analyses.

3. RESULTS

As illustrate in Table 1, socio-demographic characteristics of participants. The study included 279 participants, 62.7% were females and 37.3% were males. 93.2% of participants aged 18-25 years old and 6.8% aged between 26-35 years old. 97.5% of participants were single. 22.4% were in the fourth academic year, 24.7% in the fifth year and 17.9% were in the sixth year. 99.3% didn't have children while 0.7% had 1-2 children.

Table 1 Socio-demographic characteristics of participants (n=279)

Parameter		No.	Percent
Gender	Male	104	37.3
	Female	175	62.7
Age	18 - 25 years old	260	93.2
	26 - 35 years old	19	6.8
Marital status	Single	272	97.5
	Married	6	2.2
	Divorced	1	4
Occupation	I work part time	8	2.9
	Private job	1	4
	I do not work	270	96.8
Academic level	First	15	5.4
	The second	33	11.8
	Third	35	12.5
	Fourth	63	22.6
	Fifth	69	24.7
	Sixth	50	17.9
	Internship	14	5.0
Number of children	1-2	2	0.7
	I do not have a child	277	99.3

As shown in Figure 1, Working or studying online during quarantine among participants; most participants (93%) were working or studying online during quarantine.

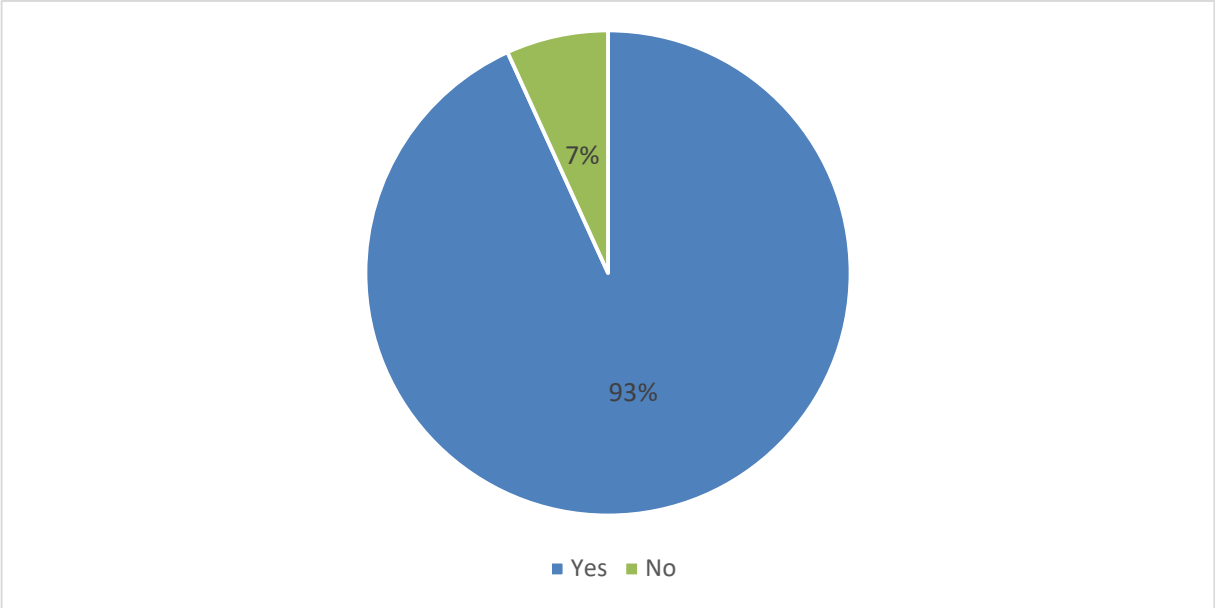

Figure 1 Working or studying online during quarantine among participants

Health and weight status among participants 22.6% of participants reported that their weight was decreased during quarantine, 39.4% reported increase in weight and 27.2% reported weight stability. 47.6% of those who lost weight intended to lose weight and 12.7% of who gained weight was intended. Only 35.5% of participants were to return to normal weight after quarantine. General health condition was excellent among 40.9% during the quarantine and 44.4% after quarantine and 2.2% reported bad health condition before 2.5% after quarantine. As regards history of diseases the majority 74.2% had on history of diseases before quarantine and 82.4% during or after quarantine. 25.4% reported that the situation has not changed in health condition after the quarantine period, 10.8% got better and only 2.2% got worse (Table 2).

Table 2 Health and weight status among participants

Parameter		No.	Percent
General health condition during the quarantine	Excellent	114	40.9
	Very good	84	30.1
	Good	56	20.1
	Acceptable	19	6.8
	Bad	6	2.2
General health condition before the quarantine	Excellent	124	44.4
	Very good	97	34.8
	Good	41	14.7
	Acceptable	10	3.6
	Bad	7	2.5
History of diseases before quarantine	Anemia	23	8.2
	Depression	33	11.8
	Obesity	21	7.5
	Diabetes	7	2.5
	Hypertension	7	2.5
	None	207	74.2
History of diseases during or after quarantine	Anemia	16	5.7
	Depression	24	8.6
	Obesity	14	5.0
	Diabetes	5	1.8
	Hypertension	6	2.2
	None	230	82.4
Change in health condition after the quarantine period	Got better	30	10.8
	Got worse	6	2.2
	The situation has not changed	71	25.4

As in Table 3, before quarantine 39.4% had meals from home with one quick meal (or frozen food) per week, 27.2% from home with more than three fast food (or frozen food) a week, 20.8% from home only, 10.4% had fast food or frozen food and only 2.2% had healthy meals. As regards Meals during quarantine, more than half 62% had meals from home, 26.2% have meals from home with one quick meal (or frozen food) per week, 7.5% had meals from home with more than three fast food (or frozen food) a week, 3.2% reported eating fast food or frozen food and 1.1% eating healthy food. Nearly half of cases 55.6% had 1-2 meals before quarantine but, 53.3% had 3-4 meals during quarantine. 59.5% having breakfast before quarantine and 67.7% during quarantine. 31.9% of participants eating fewer meals during quarantine than after quarantine which was due to lack-time in 36% of them, 27% reported anorexia and 22.5% to lose weight however, during quarantine the majority 81.7% said no for eating fewer meals than the present time. Two thirds of participants 60.6% reported that they were drinking 1-4 glasses of water per day before quarantine and 50.2% during quarantine.

Table 3 Nutritional habits status among participants

Parameter		No.	Percent
Weight change during quarantine	Weight stability	76	27.2
	Increase in weight	110	39.4
	Weight loss	63	22.6
	I don't know	30	10.8
If lost weight, intentional?	Yes	30	47.6
	No	33	52.4
If gained weight, intentional?	Yes	14	12.7
	No	96	87.3
Ability to return to normal weight after quarantine	Yes	61	35.3
	No	64	37.0
	I don't know	48	27.7
Meals before quarantine	From home	58	20.8
	From home with one quick meal (or frozen food) per week	110	39.4
	From home with more than three fast food (or frozen food) a week	76	27.2
	Fast food or frozen food	29	10.4
	Healthy meals	6	2.2
Meals during quarantine	From home	173	62.0
	From home with one quick meal (or frozen food) per week	73	26.2
	From home with more than three fast food (or frozen food) a week	21	7.5
	Fast food or frozen food	9	3.2
	Healthy food	3	1.1
Number of meals before quarantine	1-2 meals	155	55.6
	3-4 meals	115	41.2
	More than 5 meals	9	3.2
Number of meals during quarantine	1-2 meals	107	38.4
	3-4 meals	150	53.8
	More than 5 meals	22	7.9
Having breakfast before quarantine	Yes	166	59.5
	No	113	40.5
Having breakfast during quarantine	Yes	189	67.7
	No	90	32.3
Eating fewer meals during quarantine than after quarantine	Yes	89	31.9
	No	190	68.1
If yes, why?	Due to lack-time	32	36.0
	Fasting	3	3.4
	Anorexia	24	27.0
	To lose weight	20	22.5
	To reduce the amount of food consumed	10	11.2
Eating fewer meals during quarantine than the present time	Yes	51	18.3
	No	228	81.7
If yes, why?	Due to lack-time	6	11.8
	Difficulty getting to restaurants	1	2.0

	Fasting	6	11.8
	Anorexia	14	27.5
	To lose weight	13	25.5
	There is no specific reason	11	21.6
Number of water glasses of water per day before quarantine	1-4 cups	169	60.6
	5-7 cups	82	29.4
	8 cups or more	28	10.0
Number of water glasses of water per day during quarantine	1-4 cups	140	50.2
	5-7 cups	94	33.7
	8 cups or more	45	16.1

As in Table 4, before quarantine, 40.9% of cases were spending 3-5 hours on using electronic devices for work or study, 33.7% spent more-than five-hours. However, after quarantine 12.2% spent 3-5 hours and 77.1% spent more-than five-hours on using electronic devices for work or study. For entertainment before quarantine, 35.8% spent an hour or two on using electrical devices, 32.3% spent 3-5 hours and 22.9% spent more-than five-hours. During quarantine, 15.1% of cases spent an hour or two on using electronic devices for entertainment, 31.5% spent 3-5 hours and 47.7% spent more-than five-hours.

Table 4 Screen time among participants

Parameter		No.	Percent
Hours spent on using electronic devices for work or study before quarantine	An hour or two	56	20.1
	3-5 hours	114	40.9
	More-than five-hours	94	33.7
	I never did that	15	5.4
Hours spent on using electronic devices for work or study after quarantine	An hour or two	20	7.2
	3-5 hours	34	12.2
	More-than five-hours	215	77.1
	I never did that	10	3.6
Hours spent on using electronic devices for entertainment before quarantine	Less than 30 minutes	25	9.0
	An hour or two	100	35.8
	3-5 hours	90	32.3
	More-than five-hours	64	22.9
Hours spent on using electronic devices for entertainment during quarantine	Less than 30 minutes	16	5.7
	An hour or two	42	15.1
	3-5 hours	88	31.5
	More-than five-hours	133	47.7

Table 5: Half of participants (50.2%) sleep less than 7 hours per day before quarantine and 44.8% sleep 7-9 hours per day. During quarantine 17.2% sleep less-than 7 hours per day, 56.3% sleep 7-9 hours and 26.5% sleep more than 9 hours per day during quarantine. As regards sleep quality was 21.9% excellent, 43.7% very good and 9.7% bad before the quarantine. During the quarantine 33% reported excellent, 37.6% very well and 7.9% reported bad sleep quality. Before the quarantine, 34.4% of participants slept uncomfortable, 33% had trouble falling asleep, 24.7% wake up so early and can't go back to sleep, 21.1% woke a number of times and had trouble-falling to sleep-again and 42.7% reported no thing change. During the quarantine 29.4% had trouble falling asleep, 28.3% slept uncomfortable, 24.4% woke a number of times and had trouble-falling to sleep-again, 20.8% wake up so early and can't go back to sleep also, 44.8% had nothing change.

Table 5 Sleeping status among participants

Parameter		No.	Percent
Hours spent sleeping per day before quarantine	Less than 7 hours	140	50.2
	7-9 hours	125	44.8

	More than 9 hours	14	5.0
Hours spent sleeping per day during quarantine	Less than 7 hours	48	17.2
	7-9 hours	157	56.3
	More than 9 hours	74	26.5
Sleep quality before the quarantine	Excellent	61	21.9
	Very good	122	43.7
	Good	69	24.7
	Bad	27	9.7
Sleep quality during the quarantine	Excellent	92	33.0
	Very good	105	37.6
	Good	60	21.5
	Bad	22	7.9
Before the quarantine, experience of any of the following	Wake up so early and can't go back to sleep	69	24.7
	Woke a number of times and had trouble-falling to sleep-again	59	21.1
	Had trouble falling asleep	92	33.0
	Slept uncomfortable	96	34.4
	No thing	119	42.7
During the quarantine, experience any of the following	Wake up so early and can't go back to sleep	58	20.8
	Woke a number of times and had trouble-falling to sleep-again	68	24.4
	Had trouble falling asleep	82	29.4
	Slept uncomfortable	79	28.3
	Nothing	125	44.8

Most participants 60.9% had no exercises before quarantine and 49.1% had never practiced during quarantine. Also, 52% of cases didn't do household chores before quarantine. But, during quarantine 26.9% were doing household chores 1-3 times a week, 24.7% daily and 14% 4-5 times a week. Regarding activity level was moderate in 53.8% of participants before quarantine and 44.4% during. 33% reported energetic before quarantine and 19.7% during. 13.3% reported lazy before the quarantine and 35.8% during the quarantine as shown in (Table 6).

As in Table 7, in the current period most participants 86.7% have never smoked and only 5% smoke traditional cigarettes, 4.7% smoke electronic cigarettes. In case of currently smoker, 31.6% smoke 10 -15 per day, 11.1% start smoking before the quarantine period and 1.4% start during the quarantine period. The majority 68.4% not thinking of quitting smoking or using alternatives during quarantine, 32.4% reported increased number of cigarettes smoked per-day during quarantine, 27% decrease and 40.5% did not change. Regarding the reason for decrease the number of cigarettes smoked per-day or quitting smoking during quarantine; 50% decrease to reduce the possibility of health complications in case of infection with Corona, 30% unavailability of suitable places for smoking and 20% difficulty getting cigarettes. However, 50% of cases reported loss of variety of different activities or lack of activities as a reason for the increase in the number of cigarettes smoked per-day or the start of the smoking habit during quarantine, 33.3% emptiness or boredom and 16.7% worry.

Table 6 Activity status among participants

Parameter		No.	Percent
Exercising before quarantine	1-3 times a week	78	28.0
	More than 3 times a week	31	11.1
	No	170	60.9
Exercising during quarantine	1-3 times a week	89	31.9
	More than 3 times a week	53	19.0

	I have never practiced	137	49.1
Doing household chores before quarantine	Daily	48	17.2
	4-5 times a week	86	30.8
	I didn't do it	145	52.0
Doing household chores during quarantine	Daily	69	24.7
	1-3 times a week	75	26.9
	4-5 times a week	39	14.0
Activity level before the quarantine	Energetic	92	33.0
	Lazy	37	13.3
	Moderate	150	53.8
Activity level during the quarantine	Energetic	55	19.7
	Lazy	100	35.8
	Moderate	124	44.4

Table 7 Smoking status among participants

Parameter		No.	Percent
In the current period	I only smoke traditional cigarettes	14	5.0
	I only smoke electronic cigarettes	13	4.7
	I smoke conventional cigarettes and electronic cigarettes	5	1.8
	Ex-smoker	5	1.8
	I've never smoked	242	86.7
Number of cigarettes smoked per-day if currently smoker	1- 4	5	26.3
	10 -15	6	31.6
	16 – 20	3	15.8
	21-30	2	10.5
	5 -9	3	15.8
Time start smoking if currently smoker	Before the quarantine period	31	11.1
	During the quarantine period	4	1.4
	After the quarantine period	2	.7
Thinking of quitting smoking or using alternatives during quarantine	No	13	68.4
	I quit smoking completely	1	5.3
	I quit smoking completely and started using e-cigarettes	1	5.3
	Else	4	21.1
Number of cigarettes smoked per-day has increased or decreased during quarantine	Has increased	12	32.4
	Did not change	15	40.5
	Shortage	10	27.0
Reason for decreasing the number of cigarettes smoked per-day or quitting smoking during quarantine	Difficulty getting cigarettes	2	20.0
	Unavailability of suitable places for smoking	3	30.0
	To reduce the possibility of health complications in case of infection with Corona	5	50.0
Reason for the increase in the number of cigar-ettes smoked per-day or the start of the smoking habit during quarantine	Emptiness or boredom	4	33.3
	Worry	2	16.7
	Loss of variety of different activities or lack of activities	6	50.0

4. DISCUSSION

The heart and its blood vessels comprise the cardiovascular system. Endocarditis, rheumatic heart disease and conduction system abnormalities are just a few of the problems that can arise in the cardiovascular system (Vasan et al., 2005). Lifestyle change among university students during the quarantine period has resulted in increased risk of most of modifiable CVD risk factors. This study

aimed to determine the prevalence of risk factors for CVD among medical students at Tabuk University in Tabuk, Saudi Arabia, during the quarantine of the COVID-19 outbreak.

Even in the absence of other risk factors, obesity is a strong independent predictor of CVD. Weight gain has been speculated as an unintended consequence of the pandemic's extended self-quarantine, widespread shutdown duration and adverse psychological reactions (Bhutani and Cooper, 2020). Increased sedentary behavior's, excess weight during COVID-19 self-quarantine has been linked to a decrease in physical-activity, an increase in snacking (particularly after dinner), an increase in alcohol-consumption, a decrease in water consumption, emotional-eating, a decrease in sleep-quality and being-over-weight or obese (Zeigler, 2021).

In our study, 22.6% of participants reported that their weight was decreased during quarantine, 39.4% reported increase in weight and 27.2% reported weight stability. 55.6% had 1-2 meals before quarantine but, 53.3% had 3-4 meals during quarantine. 62% had meals from home, 26.2% have meals from home with one quick meal (or frozen food) per week, 7.5% had meals from home with more than three fast food (or frozen food) a week, 3.2% reported eating fast food or frozen food and 1.1% eating healthy food. During COVID-19 self-quarantine, an article from the United Kingdom (n = 2002) discovered an 82% increase in unhealthy food in the home (Robinson et al., 2021). Furthermore, food consumption data (n = 10,769 stores) revealed that during the first 6 weeks of COVID-19 confinement, canned and frozen food consumption increased while sales of fresh goods and fruits and vegetables decreased (Bracale and Vaccaro, 2020).

It has been noted that many individuals notice drinking less-water during COVID-19 self-quarantine and instead frequently switching to sweetener beverages (Cheikh-Ismail et al., 2021; Di-Renzo et al., 2020), which was on the line with our results. For instance, cross-sectional data from the North-Africa demonstrated that 74 percent of respondents indicated drinking-less than eight cups of water per-day (Cheikh-Ismail et al., 2021). Similarly, another study found that 87 percent of survey participants drank less than 2 litres of water per day and 26 percent drank less than 1 litre per day (Di-Renzo et al., 2020). Furthermore, Low water consumption during-the COVID-19 subconscious is associated with a rise in body-weight, according to logistic-regression (Reyes-Olavarría et al., 2020). Indeed, raising the water-temperature consumed and altering the cell's-osmolarity are linked to higher energy-expenses (Buschmann et al., 2003). Furthermore, as according studies, drinking-water may affect how you feel when you're full (Dennis et al., 2010).

All degrees of physical activity have been negatively impacted by COVID-19 self-quarantine (vigorous-moderate-overall) (Ammar et al., 2020). According to our results, activity level had decreased among participants during quarantine. According to 43 to 61 percent of the population saw a decline in physical-activity through the COVID-19 self-quarantine, according to massive data from Australian, Spain and France (Deschasaux-Tanguy et al., 2021; Phillipou et al., 2020). As a result, while sedentary behaviour and exercise are two distinct weight-loss constraints, COVID-19 self-quarantine may cause adverse changes in both. Surprisingly, some data indicate found-individuals who kept up with or increased their physical activity while they were sequestered were more-likely to be active prior the pandemic (Deschasaux-Tanguy et al., 2021). For example, a study of (n=3533) participants discovered that those who already participated in sports increased their exercise frequency, whereas those who did not previously exercise did not begin (Di-Renzo et al., 2020). COVID-19 self-quarantine could have reinforced previous behaviors.

Inadequate sleep is becoming more common and the impact on health and quality of life is still unknown. The cardiovascular consequences appear to be substantial and significant in and of them. Sleep duration at either extreme has been linked to an increased prevalence and incidence of cardiovascular diseases such as hypertension, coronary heart disease and stroke (Covassin and Singh, 2016). During-COVID19 self-quarantine there has been recorded that sleep habits have changed. Some data suggests that the number of hours-slept has risen (Cheikh-Ismail et al., 2021; Di-Renzo et al., 2020). The correlation between-sleep-duration and weight-gain is U-shaped, with sleep duration predicting weight gain when it exceeds a certain level (Zeigler, 2021). While sleep-duration may have-increased, sleep-during COVID19 self-quarantine has been reported to be disrupted and of poor-quality (Cheikh-Ismail et al., 2021; Di-Renzo et al., 2020). Half of our participants (50.2%) sleep less than 7 hours per day before quarantine and 44.8% sleep 7-9 hours per day. During quarantine 17.2% sleep less-than seven-hour per-day, 56.3% sleep 7-9 hours and 26.5% sleep more than 9 hours per day during quarantine. As regards Sleep quality was 21.9% excellent, 43.7% very good and 9.7% bad before the quarantine. During the quarantine 33% reported excellent, 37.6% very well and 7.9% reported bad sleep quality. For example, one study found that 63.2 percent of subjects reported sleep disturbances during the pandemic, compared to only 53 percent before the pandemic. Decreased sleep quality-predicts COVID-19 (self) quarantine weight-gain independently (Zachary et al., 2020). A previous study found that 45 percent of participants who experienced worsening sleep quality gained an average of .5 kg (Cremasco et al., 2021). However, no weight-gain was showed in participants who reported improved sleep quality. Pre-COVID-19 pandemic data show that poor-sleep-quality affects physical-functioning the following day, leading to sedentary behaviors (Sher, 2020).

Discretionary screen time (time spent watching television or using a computer screen during leisure time) contributes significantly to total sedentary behaviors, which is linked to an increased risk of mortality and cardiovascular disease (CVD) (Celis-Morales et al., 2018). Our study found an increase in screentime, which corresponded to a study that found that weekly recreational screen time increased from 25.9 ±11.9 h in 2018 to 28.5 ±11.6 h during COVID-19 (p 0.001) (Celis-Morales et al., 2018). Given the potential mental and physical health consequences of passive sedentary behaviour and screen time, monitoring and understanding trends in screen time during COVID-19 is critical to understanding the pandemic's overall health impacts (Leblanc et al., 2017).

Smoking increases all-cause mortality and plays an important involvement in cardio-vascular disease with atherosclerosis (ASCVD). Upwards of 30 percent of mortality due to coronary-heart-disease (CHD) are caused by active smoking or secondhand smoke. Because cigarette smoking is a complex combination of chemical-substances that are either freely in the gas-phase or attached to aerosol-particles, it is the most perplexing and complex risk factor for CVDs. Cigarette smoke contains over 7,000 chemical compounds from numerous classes, including at least 72 carcinogens (Gallucci et al., 2020). The COVID-19 and economic crises were two of the most commonly cited reasons for smoking behaviour change. Both of these factors were found to be more strongly linked to an increase in smoking. This is expected as high stress levels are associated with an increased prevalence of smoking (Richards et al., 2011).

In our study, 31.6% smoke 10 -15 per day, 11.1% start smoking before the quarantine period and 1.4% start during the quarantine period. The majority 68.4% not thinking of quitting smoking or using alternatives during quarantine, 32.4% reported increased number of cigarettes smoked per-day during quarantine, 27% decrease and 40.5% did not change. Regardless of the reduction in smoking-prevalence, the bulk of the worsening-smoking behaviors were due to an increase in cigarette-consumption, 36 percent of smokers reporting-smoking more than they did-before the lock-down, with an average-increase of six cigarettes per-day (Carreras et al., 2022). In fact, according to a poll of 490-people, and over a quarter of smokers upped their cigarette-consumption throughout lock-down (Cancello et al., 2020). Another survey of 3533 people, mostly (female- 76%), found-that smoking-prevalence had decreased from 25.1 percent to 21.8 percent, with 3.3 percent of smokers quitting during the lockdown (Di-Renzo et al., 2020). A survey of 2125 Italian university students found that smoking prevalence had decreased from 39.7 percent to 36.0 percent (Gallè et al., 2020). Following a Dutch-survey, the most-stressed people who smoke changed their own smoking-behavior during the first-wave of the COVID19 lock-down, suggesting that for some-smokers, boredom and social-isolation may have encouraged smoking while for others, fear of contracting-COVID19 and falling seriously ill may have-motivated them to give-up smoking (Bommelé et al., 2020).

The influencing role of mental health should not be overlooked when interpreting the findings on the impact of COVID-19 lockdown measures on modifiable cardiovascular risk factors. Experts recommend several preventive measures to reduce COVID-19 lockdown and quarantine-related (cardiovascular) risky health behaviours. Because the results of prevention studies have not yet been published, it is currently impossible to determine whether these measures have an actual preventive effect. Targeting not only cardiovascular risk factors should be the focus of interventions when planning cardiovascular health promotion for pandemic lockdown situations, but targeting mental health should also be a priority due to its influencing role in the association between COVID-19 lockdown measures and health behavior's such as smoking, physical-activity, alcohol-consumption and nutrition.

5. CONCLUSION

In conclusion, quarantine time had resulted in increased risk of CVD among our sampled study as physical activity decreased and sedentary behaviour increased. Further, cardiovascular risk awareness should be raised among adults in general and university students specially to control CVD prevalence among young adults.

Ethics statement

Ethical approval was obtained from the Research Ethical Committee at Faculty of Medicine in Tabuk University, Tabuk City, Saudi Arabia (Ethical approval number: UT-194-53-2022). Participants were informed that their participation is voluntary and filling the questionnaire indicates their consent to participate.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

REFERENCES AND NOTES

1. Ahmadjee A, Alghamdi A, Alsharif A, Hasrat G, Alghamdi A, Mahzari F, Alzahrani KT. Population awareness of CVD risk factors and lifestyle modifications according to their knowledge. Medical Science 2022; 26:ms363e2445. doi: 10.54905/disssi/v26i127/ms363e2445
2. Alamri HS, Algarni A, Shehata SF, Al-Bshabshe A, Alshehri NN, AL-Asiri AM, Hussain AH, Alalmay AY, Alshehri EA, Alqarni Y, Saleh NF. Prevalence of depression, anxiety and stress among the general population in Saudi Arabia during COVID-19 pandemic. Int J Environ Res Public Health 2020; 17:1–11.
3. Alfawaz H, Amer OE, Aljumah AA, Aldisi DA, Enani MA, Aljohani NJ, Alotaibi NH, Alshingetti N, Alomar SY, Khattak MNK, Sabico S, Al-Daghri NM. Effects of home quarantine during COVID-19 lockdown on physical activity and dietary habits of adults in Saudi Arabia. Sci Rep 2021; 11:5904.
4. Ammar A, Brach M, Trabelsi K, Chtourou H, Boukhris O, Masmoudi L, Bouaziz B, Bentlage E, How D, Ahmed M, Müller P, Müller N, Aloui A, Hammouda O, Paineiras-Domingos LL, Braakman-Jansen A, Wrede C, Bastoni S, Pernambuco CS, Mataruna L, Taheri M, Irandoust K, Khacharem A, Bragazzi NL, Chamari K, Glenn JM, Bott NT, Gargouri F, Chaari L, Batatia H, Ali GM, Abdelkarim O, Jarraya M, Abed KE, Souissi N, Gemert-Pijnen LV, Riemann BL, Riemann L, Moalla W, Gómez-Raja J, Epstein M, Sanderman R, Schulz SV, Jerg A, Al-Horani R, Mansi T, Jmail M, Barbosa F, Ferreira-Santos F, Šimunič B, Pišot R, Gaggioli A, Bailey SJ, Steinacker JM, Driss T, Hoekelmann A. Effects of COVID-19 home confinement on eating behaviour and physical activity: Results of the ECLB-COVID19 international online survey. Nutrients 2020; 12(6): 1583. doi: 10.3390/nu12061583
5. Bhutani S, Cooper JA. COVID-19–Related home confinement in adults: Weight gain risks and opportunities. Obesity (Silver Spring) 2020; 28:1576–1577.
6. Bommelé J, Hopman P, Walters BH, Geboers C, Croes E, Fong GT, Quah ACK, Willemsen M. The double-edged relationship between COVID-19 stress and smoking: Implications for smoking cessation. Tob Induc Dis 2020; 18: 63.
7. Bracale R, Vaccaro CM. Changes in food choice following restrictive measures due to Covid-19. Nutr Metab Cardio vasc Dis 2020; 30:1423–1426.
8. Buschmann M, Steiniger J, Hille U, Tank J, Adams F, Sharma AM, Klaus S, Luft FC, Jordan J. Water-Induced thermogenesis. J Clin Endocrinol Metab 2003; 88:6015–6019.
9. Cancello R, Soranna D, Zambra G, Zambon A, Invitti C. Determinants of the lifestyle changes during COVID-19 pandemic in the residents of northern italy. Int J Environ Res Public Health 2020; 17:1–14.
10. Caponnetto P, Inguscio L, Saitta C, Maglia M, Benfatto F, Polosa R. Smoking behavior and psychological dynamics during COVID-19 social distancing and stay-at-home policies: A survey. Health Psychol Res 2020; 8(1):9124.
11. Carreras G, Lugo A, Stival C, Amerio A, Odone A, Pacifici R, Gallus S, Gorini G. Impact of COVID-19 lockdown on smoking consumption in a large representative sample of Italian adults. Tob Control 2022; 31:615–622.
12. Celis-Morales CA, Lyall DM, Steell L, Gray SR, Iliodromiti S, Anderson J, Mackay DF, Welsh P, Yates T, Pell JP, Sattar N, Gill JMR. Associations of discretionary screen time with mortality, cardiovascular disease and cancer are attenuated by strength, fitness and physical activity: Findings from the UK Biobank study. BMC Med 2018; 16(1):77. doi: 10.1186/s12916-018-1063-1
13. Cheikh-Ismail L, Osaili TM, Mohamad MN, Al-Marzouqi A, Jarrar AH, Zampelas A, Habib-Mourad C, Jamous DOA, Ali HI, Al-Sabbah H, Hasan H, Al-Marzooqi LMR, Stojanovska L, Hashim M, Obaid RRS, ElFeky S, Saleh ST, Shawar ZAM, Al-Dhaheri AS. Assessment of eating habits and lifestyle during the coronavirus 2019 pandemic in the Middle East and North Africa region: A cross-sectional study. Br J Nutr 2021; 126:757–766.
14. Covassin N, Singh P. Sleep duration and cardiovascular disease risk epidemiologic and experimental evidence. Sleep Med Clin 2016; 11:81–89.
15. Cremasco MM, Mulasso A, Moroni A, Testa A, Degan R, Rainoldi A, Rabaglietti E. Relation among perceived weight change, sedentary activities and sleep quality during COVID-19 lockdown: A study in an academic community in Northern Italy. Int J Environ Res Public Health 2021; 18:2943.
16. Dennis EA, Dengo AL, Comber DL, Flack KD, Savla J, Davy KP, Davy BM. Water consumption increases weight loss during a hypo caloric diet intervention in middle-aged and older adults. Obesity (Silver Spring) 2010; 18:300–307.
17. Deschasaux-Tanguy M, Druesne-Pecollo N, Esseddik Y, Edelenyi FSD, Allès B, Andreeva VA, Baudry J, Charreire H,

Deschamps V, Egnell M, Fezeu LK, Galan P, Julia C, Kesse-Guyot E, Latino-Martel P, Oppert JM, Péneau S, Verdot C, Hercberg S, Touvier M. Diet and physical activity during the coronavirus disease 2019 (COVID-19) lockdown (March-May 2020): Results from the French Nutri Net-Santé cohort study. Am J Clin Nutr 2021; 113:924–938.

18. Di-Renzo L, Gualtieri P, Pivari F, Soldati L, Attinà A, Cinelli G, Leggeri C, Caparello G, Barrea L, Scerbo F, Esposito E, De Lorenzo A. Eating habits and lifestyle changes during COVID-19 lockdown: An Italian survey. J Transl Med 2020; 18:229. doi: 10.1186/s12967-020-02399-5
19. Gallè F, Sabella EA, Molin GD, De-Giglio O, Caggiano G, Di-Onofrio V, Ferracuti S, Montagna MT, Liguori G, Orsi GB, Napoli C. Understanding knowledge and behaviors related to covid−19 epidemic in Italian undergraduate students: The epico study. Int J Environ Res Public Health 2020; 17:3481.
20. Gallucci G, Tartarone A, Lerose R, Lalinga AV, Capobianco AM. Cardiovascular risk of smoking and benefits of smoking cessation. J Thorac Dis 2020; 12:3866–3876.
21. Gutierrez J, Alloubani A, Mari M, Alzaatreh M. Cardiovascular Disease Risk Factors: Hypertension, diabetes mellitus and obesity among Tabuk Citizens in Saudi Arabia. Open Cardiovasc Med J 2018; 12:41–49.
22. Ibrahim NK, Mahnashi M, Aldhaheri A, Al-Zahrani B, Al-Wadie E, Aljabri M, Al-Shanketi R, Al-Shehri R, Al-Sayes FM, Bashawri J. Risk factors of coronary heart disease among medical students in King Abdulaziz University, Jeddah, Saudi Arabia. BMC Public Health 2014; 14:411.
23. Ismail LC, Osaili TM, Mohamad MN, Al-Marzouqi A, Jarrar AH, Jamous DOA, Magriplis E, Ali HI, Al-Sabbah H, Hasan H, Al-Marzooqi LMR, Stojanovska L, Hashim M, Obaid RRS, Saleh ST, Al-Dhaheri AS. Eating habits and lifestyle during COVID-19 lockdown in the United Arab Emirates: A cross-sectional study. Nutrients 2020; 12(11):3314.
24. Issa LF, Alharthi Y, Alsuqair R, Al-aqile A, Almotairi S, Aljuaid A, Althagafi B, Alghamdi E, Althobity T, Al-Sharif A, Alzahrani K. Coronary artery disease risk factors in Saudi Arabia: Knowledge, awareness and prevalence assessment. Medical Science 2022; 26: ms476e2556. doi: 10.54905/disssi/v26i129/ms476e2556
25. Leblanc AG, Gunnell KE, Prince SA, Saunders TJ, Barnes JD, Chaput JP. The ubiquity of the screen: An overview of the risks and benefits of screen time in our modern world. Transl J Am Coll Sports Med 2017; 2(17):104-113.
26. Phillipou A, Meyer D, Neill E, Tan EJ, Toh WL, Van-Rheenen TE, Rossell S. Eating and exercise behaviors in eating disorders and the general population during the COVID-19 pandemic in Australia: Initial results from the COLLATE project. Int J Eat Disord 2020; 53:1158–1165.
27. Reyes-Olavarría D, Latorre-Román PÁ, Guzmán-Guzmán IP, Jerez-Mayorga D, Caamaño-Navarrete F, Delgado-Floody P. Positive and negative changes in food habits, physical activity patterns and weight status during COVID-19 confinement: Associated factors in the Chilean population. Int J Environ Res Public Health 2020; 17:5431.
28. Richards JM, Stipelman BA, Bornovalova MA, Daughters SB, Sinha R, Lejuez CW. Biological mechanisms underlying the relationship between stress and smoking: State of the science and directions for future work. Biol Psychol 2011; 88 :1–12.
29. Robinson E, Boyland E, Chisholm A, Harrold J, Maloney NG, Marty L, Mead BR, Noonan R, Hardman CA. Obesity, eating behavior and physical activity during COVID-19 lockdown: A study of UK adults. Appetite 2021; 156:104853.
30. Sher L. COVID-19, anxiety, sleeps disturbances and suicide. Sleep Med 2020; 70:124.
31. Vasan RS, Sullivan LM, Wilson PW, Sempos CT, Sundström J, Kannel WB, Levy D, D'Agostino RB. Relative importance of borderline and elevated levels of coronary heart disease risk factors. Ann Intern Med 2005; 142(6):393-402. doi: 10.7326/0003-4819-142-6-200503150-00005
32. Xu S, Jiayong Z, Li B. Prevalence and clustering of cardiovascular disease risk factors among Tibetan adults in China: A population-based study PLoS One 2015; 10(6):e0129966. doi: 10.1371/journal.pone.0129966
33. Zachary Z, Brianna F, Brianna L, Garrett P, Jade W, Alyssa D, Mikayla K. Self-quarantine and weight gain related risk factors during the COVID-19 pandemic. Obes Res Clin Pract 2020; 14:210–216.
34. Zeigler Z. COVID-19 Self-quarantine and weight gain risk factors in adults. Curr Obes Rep 2021; 10:423–433.