Hamburg University of Applied Sciences

Faculty of Life Sciences
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Master's in Public Health

Knowledge, Attitude and Practice towards COVID-19 among adults (18-64 years) in Hamburg Metropolitan City

Master Thesis

Date of Submission: 16.11.2021

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Acknowledgement

This thesis is dedicated to my parents Roshani Tuladhar & Ram Ratna Tuladhar and my brother Ashish Tuladhar. I would also like to thank my family members for their unconditional love and support.

I would like to express my sincere graditute to my supervisors Prof. Dr. Walter Leal and Dr. Adedeji Adekunle for their continuous support and guidance throughout this journey. I thank them for their excellent supervison, valuable comments and advices.

I also take this opportunity to thank Prof. Dr. Ralf Reintjes, Ms. Wiebke Bendt and Mr. Gunnar Paetzelt for their support and guidance during the entire period of my master study.

My sincere thanks also goes to my friends, who have directly or indirectly helped me in this venture.

Last but not the least, I would like to thank my partner Deeraj Rajkarnikar for his continuous support and encouragement.

List of abbreviations

%	Percentage
ANOVA	Analysis of variance
CDC	Chinese Center for Disease Control and Prevention
COVID-19	Coronavirus disease 2019
HAW	Hamburg University of Applied Sciences
IBM	International business machines
KAP	Knowledge, Attitude, Practice
N	Number
p	p value
QOL	Quality of life
r	Correlation coefficient
RKI	Robert Koch Institute
SARS	Severe acute respiratory syndrome
SARS-CoV-2	Severe acute respiratory syndrome coronavirus disease 2
SD	Standard deviation
Sig	Significant
SPSS	Statistical Package for the Social Sciences
UAE	United Arab Emirates
WHO	World Health Organization

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Abstract

Introduction

COVID-19 has been recognized as the deadliest pandemic of the 21st Century, posing (and has posed) serious public health threat worldwide. Knowledge and public awareness on the disease transmission, understanding peoples' basic hygiene principles and attitudes and practices towards the disease are very important to successfully control the virus transmission. This study aims to explore the knowledge, attitude and practice towards COVID-19 among adults (18-64 years) in Hamburg Metropolitian City and understand how socio-demographic determinants affect the KAP towards the disease. It also examines the quality of life of adults during the fourth wave of COVID-19 in Hamburg.

Methods

A cross sectional online survey questionnaire was distributed to the adult population (18-64 years) in Hamburg. The questionnaire was developed in both German and English languages. This questionnaire gathered information on respondents' socio-demographic characteristics, source of information, knowledge, attitude and practice towards COVID-19 and quality of life. Descriptive statistics were used to explore the knowledge, attitude and practice towards COVID-19 and quality of life. Independent T test and ANOVA were used to identify whether socio-demographic characteristics are associated with KAP and QOL. Lastly, Pearson's Correlation Coefficient was used to find the assocation between knowledge, attitude, practice and quality of life.

Result

A total of 292 participants were recruited, out of which 186 were female and 106 were male with a mean age of 28.23 years. The study findings suggest that 68.8% of respondents had moderate knowledge, 17.47% had positive attitude and 63.70% had proactive practices towards COVID-19. Based on T test and ANOVA test of significance, knowledge score was significant with gender ($p=0.008$) and practice score was significant with gender ($p<0.001$), marital status($p<0.001$) and work or study ($p=0.024$). The result also showed significant correlation between knowledge, attitude and practice. Attitude of subjects were also positively correlated with quality of life.

Conclusion

The study finding revealed that Hamburg population exhibited moderate knowledge, neutral attitude and proactive practices toward COVID-19 during the later phase of pandemic. Moreover, the participants also demonstrated good quality of life. Health education aiming to improve COVID-19 knowledge must be encouraged to bring positive attitude and proactive practices. Moreover, the general populaiton should be trained by the public health experts to cope with similar outbreak in the near future.

Keywords: COVID-19, Knowledge, Attitude, Practice, Quality of Life, Adult population, Hamburg

1. Introduction

In December 2019, several local health authorities in Wuhan city, Hubei province of China, reported a cluster of patients with pneumonia-like symptoms of unknown cause (Hu et al., 2020; Zhu et al., 2020). As of the 31st of December 2019, Wuhan Municipality Health Commission reported 27 hospitalized cases, including seven severe cases (Deng & Peng, 2020). On the 9th of January 2020, Chinese Center for Disease Control and Prevention (CDC) and Chinese health authorities had identified a new strain of coronavirus (2019-nCoV) responsible for the outbreak of viral pneumonia in Wuhan (Deng & Peng, 2020; Zhu et al., 2020).

The novel coronavirus rapidly spread to all 34 provinces of China within one month, resulting in thousands of new and confirmed cases (Deng & Peng, 2020; Hu et al., 2020). As number of cases increased exponentially worldwide, World Health Organization (WHO) declared the novel coronavirus outbreak as a public health emergency (Gorbalenya et al., 2020). Later, on the 11th of February 2020, the disease was officially named Coronavirus disease (COVID-19) by WHO. The causative agent of the virus was called SARS-CoV-2 by International Committee on Taxonomy of Viruses (Gorbalenya et al., 2020) and was categorized under beta-coronaviruses.

In humans, the SARS-CoV-2 infection affects the immune system, triggering inflammation in both respiratory tract and intestines. A study from (Deng & Peng, 2020) has shown that most patients who develop mild symptoms have a favourable prognosis, while some patients are left in a critical situation or do not survive (Deng & Peng, 2020). Although all age groups experience similar symptoms, aged patients and patients with underlying medical conditions like heart or lung problems, diabetes, and cancer are at higher risk of developing severe illness and poor prognoses (World Health Organization, 2020a). Children usually present mild cases of manifestation (Deng & Peng, 2020).

The number of reported cases of COVID-19 continued to escalate globally. By late February 2020, the SARS-CoV-2 infection had spread to many countries worldwide, including Germany, France, the United Kingdom, Italy, Finland, Sweden, Spain and Belgium (Lai et al., 2020). In March 2020, there were around

118,000 cases and 4,821 deaths in more than 114 countries (World Health Organization, 2020c), prompting WHO to officially declare the COVID-19 outbreak as a pandemic (World Health Organization, 2020b, 2020c).

1.1. COVID-19 in Germany

1.1.1. Prevalence of COVID-19

In Germany, the first case of COVID-19 was recorded on the 28th of January 2020 (European Centre for Disease Prevention and Control, 2020). About two months later, the Robert Koch Institute (RKI) in Berlin had reported 61,913 confirmed COVID-19 cases and 583 deaths due to COVID-19 in all 16 federal states of the country. By the end of March 2020, highest incidence (cases per 100,000) of COVID-19 were recorded in states of Hamburg (119), Bavaria (113) and Baden-Württemberg (111) (Robert Koch Institute, 2020a).

1.1.2 . Strategies to reduce transmission in Germany

Starting from the 23rd of March 2020, the German government began implementing lockdowns to limit physical contact. Non-essential businesses and services were closed to restrict movement and contact among people to slow spread of the virus (Robert Koch Institute, 2020a). The so-called “lockdown” included closure of schools, kindergartens, parks, shops, gyms, restaurants, closed borders, travel ban, cancellation of events and other leisure activities. In addition, the government also imposed physical distancing measures and contact restrictions, allowing no more than two people to meet in public places. Furthermore, in the absence of specific treatment for COVID-19, the authorities implemented several other approaches to reduce virus transmission through proper prevention and control measures. For example, physical hygiene was prioritized. The public were encouraged to wash their hands regularly, disinfect objects and surfaces. Moreover, other public health measures such as maintaining physical distance and using facial masks were mandated.

The effect of the lockdowns and restrictions on the population’s social, economic, physical, and psychological well-being has led to debates on their effectiveness (Lippi et al., 2020). It may affect public attitudes towards the pandemic.

As a more lasting solution, Germany and several other countries also developed effective vaccines against SARS-CoV-2. Vaccine development and utilization against diseases in public health are considered the most logical and preferred protective approaches for the general public (Han, 2015). However, some of the general population's reception of COVID-19 vaccines has been marred with scepticism and doubt. For example, a recent study has shown that 28.5% of the survey respondents reported of not accepting the COVID-19 vaccine (Lazarus et al., 2020). Around 61.4% of the respondents reported accepting the COVID-19 vaccine if their employers recommend it. Moreover, countries with strong trust in their government, such as China, South Korea and Singapore, reported a higher willingness to accept COVID-19 vaccines (Lazarus et al., 2020). Other countries such as Poland and Russia reported highest number of negative responses and least positive reactions towards accepting the COVID-19 vaccine (Lazarus et al., 2020).

From the study mentioned above, vaccine skepticism is clearly visible in the sample population. The paper also suggests that targeted interventions such as building trust and clear communication among health authorities and scientists, and regular feedback from communities are essential to building vaccine literacy (Lindholt et al., 2021). These measures might sustain the public acceptance of the COVID-19 vaccine during the ongoing pandemic and prepare for other health emergencies in the near future.

1.2. COVID-19 in Hamburg

1.2.1. Trends of COVID-19 in Hamburg

City of Hamburg confirmed its first case of COVID-19 on the 27th of February 2020. Within one week period, cases started to rise in the city (DW, 2020). Few days after reporting the first case, Hamburg government cancelled large events, concerts, and theater performances (NDR, 2021). As cases started to increase, the government decided to shut down schools, daycare centers, fish markets, and most retail shops to slow down the spread of the virus (NDR, 2021). Closure of retail shops initially created a bit of panic among the general public (NDR, 2021). Due to this, they started to buy and stock food and supplies in bulk, leading to a shortage of flour, yeast, pasta, and toilet paper in supermarkets (NDR, 2021). As

of 30th of May 2020, Robert Koch Institute reported a cumulative incidence of 276 cases per 100,000 individuals and 13.4 deaths per 100,000 individuals in Hamburg (Robert Koch Institute, 2020b). This incidence number was the third-highest in Germany after the states of Bavaria and Baden-Wurttemberg (Robert Koch Institute, 2020b).

1.2.2. Measures and strategies to reduce COVID-19 transmission in Hamburg

Cases started to rise further in Hamburg, and tighter restrictions implemented by Federal chancellor and head of the government were followed in the city beginning from the 23rd of March 2020. Restrictions such as maintaining a distance of 1.5 meters, forbidding gathering of more than two people in public places and closure of restaurants and other businesses responsible for public gatherings were imposed (Die Bundesregierung, 2020). Along with these restrictions, wearing medical masks in public places were made mandatory in Hamburg. Masks had to be worn covering both mouth and nose in public transports, train stations, farmers markets, supermarkets, and schools. These restrictions were also implemented in selected areas such as Reeperbahn, St. Pauli-Landugsbrücken, Mönckebergstrasse (Hamburger Stadtportal, 2020; U.S. Mission Germany, 2020). A fine of €40 was imposed on individuals not wearing a mask in public (The Local, 2020).

1.2.3. Protest against COVID-19 related restrictions

Although the number of coronavirus infections continued to rise in Hamburg, some people questioned the existence of COVID-19 and were sceptic about the restrictions and measures taken by the government. The effect of lockdown and restrictions also led to many protests in Hamburg. For example, a group of demonstrators gathered to demonstrate anti-lockdown rallies without following any recommended public health measures for COVID-19 on the 20th of May 2020 (Tasnim News Agency, 2020). Therefore, these protesters were charged and dispersed by the police for violating the restrictions (Tasnim News Agency, 2020). One anti-lockdown protestor argued that “many people have died from postponing planned surgeries than from the coronavirus itself ” (Tasnim News Agency, 2020). Further anti lockdown protests were organized in different German cities, including

in Rathausmarkt in Hamburg, on the 17th of April 2021 to denounce COVID-19 restrictions (GardaWorld, 2021).

1.3. Rationale and study objectives

1.3.1. Rationale

There is no doubt that COVID-19 has become a significant global public health concern. To reduce the spread of infection, the German government has imposed unprecedented measures. However, the measures from the government alone are not enough. It is crucial to create public awareness to correct misconceptions and prevent further spread of COVID-19. The assessment of knowledge, attitude and practice (KAP) towards COVID-19 is valuable to know willingness of societies to accept behavioural changes recommended by public health experts. Furthermore, it may also serve to determine people's understanding of basic hygiene principles and route of disease transmission, and their attitude and practices towards the disease in general. This is very important to ensure effective and successful control of virus transmission.

Several epidemiological studies have shown that adequate knowledge and awareness regarding a disease have encouraged people to adopt preventive behavior in society. For instance, the results from recent studies such as (Lau et al., 2020; Papagiannis et al., 2020) have shown that high-level knowledge is significantly related to practice of preventive measures. Also, people's attitudes are positively associated with the adaptation of preventative measures - indicating that people with positive attitude are more likely to practice preventive health measures.

In contradiction, a previous study conducted during SARS epidemic in 2003 among travellers and community residents visiting health centres in Qatar demonstrated that 79.4% of the respondents were aware of the term "SARS''. However, only 8% of the respondents had adequate knowledge of signs and symptoms associated with the disease (Bener & Al-Khal, 2004). Another study related to respiratory tract infection exhibited majority of respondents were aware of clinical aspects of the disease, such as their causes, risk factors and mode of transmissions. However, only one-fourth of the subjects had sufficient knowledge of complications associated with the disease (Dauda Goni et al., 2019). Although results from the

study revealed that the subjects had good knowledge on preventing respiratory infections, it was surprising to see that only 16.9% of the respondents practised it (Dauda Goni et al., 2019). This could be because of their unacceptable attitude towards the disease, as reported by 93.8% of the respondents (Dauda Goni et al., 2019). The results highlight gaps in their knowledge, attitude, and practice towards the disease, which could be improved through proper training and health education campaigns.

Demographic composition of society generally has highest population among the “adults” age groups (18–64-year-olds) (Statista, 2019). People from these population groups also tend to be more present in activities consisting of gathering large numbers of people. These activities could range from public activities in their communities to recreational activities such as parties. Hence, assessment of KAP towards COVID-19 in this targeted population group would be helpful to mitigate the ongoing pandemic. Furthermore, it might also be beneficial towards infection control strategies to governments and public health organizations. Hence, this study aims to determine the knowledge, attitude and practices towards COVID-19 among the adult population in the Hamburg Metropolitan City.

1.3.2. Aim and objectives of the thesis

This study aims to explore the knowledge, attitude, and practice towards COVID-19 among adults (18-64 years) in Hamburg Metropolitan City. Furthermore, it intends to understand how socio-demographic determinants affect the knowledge, attitude, and practice of the general population towards the disease. To achieve this goal, following objectives are set.

i. To explore the association between knowledge, attitude, and practice towards COVID-19 among the adult population in Hamburg.
ii. To examine demographic and socio-economic determinants on knowledge, attitude, and practice score towards COVID-19.
iii. To investigate the association between knowledge, attitude and practice towards COVID-19 and quality of life.

2. Methods

2.1. Study area and population

The city of Hamburg is situated in the northern part of Germany. It is best known for its major port and is connected to the North Sea by the Elbe River. In addition, Hamburg has become one of the better-known cities for art, culture, history, music, social events and many more. With around 1.84 million inhabitants in an area of 755km^2, it is the second-largest city in Germany and seventh-largest overall in the European Union.

2.2. Study design and sampling

A quantitative approach was used to measure the knowledge, attitude and practice towards COVID-19 among adults in Hamburg. A cross-sectional survey was adopted in this study, and a convenience sampling technique was used to collect the study samples. A sample of eligible participants from the general population was approached via Facebook, WhatsApp, LinkedIn, and HAW-Email to participate in the survey. The partcipants were eligible for inclusion if they were between the age groups (18 - 64 years) and if they were living in Hamburg when the survey was conducted.

For determining the sample size required for determining the population parameter, acceptable size of a demographic subgroup with a ± 7% margin of error and confidence level of 95% was used (Conroy, 2015; Israel, 1992). These values resulted a target sample size of n = 196 (Conroy, 2015; Israel, 1992).

2.3. Recruitment procedure

The cross-sectional study was conducted for 3 weeks from the 1st of March to the 21st of March 2021. An online survey was chosen specially to avoid physical contact with the respondents as the main aim of this survey is to help mitigate spread of COVID-19 infection. Moreover, Germany, including Hamburg, was imposed with night curfew and lockdowns to combat COVID-19. Hence, it was not feasible to gather data in person. In this context, an online survey was the ideal method and was done using an online survey platform called “Lime Survey”.

Targeted participants, i.e., adults between 18 to 64 years currently residing in Hamburg, were made eligible to participate in this study. Several approaches were used to reach the target group within 3 weeks. This includes approaching contact person from Hamburg University of Applied Science to share the questionnaire with all faculty members, students and reaching out to personal networks to share the survey on their social media platform. Participants were contacted through various means such as Facebook, WhatsApp, LinkedIn and HAW-Email. There were two versions of the questionnaire: German, the native language in Germany and English. An invitation enclosing a general description of the survey and a link to access the survey was provided to both versions of questionnaires. A total of 338 responses were received, out of which only 292 answered the survey completely.

2.4. Measures

The questionnaire consisted of three different parts; COVID-19 knowledge, attitude and practice, Quality of life, Source of Information and Covariance. The full questionnaire is available in Appendix.

2.4.1. COVID-19 knowledge, attitude and practice

A total of 15 self-administered questions were used to access the respondents' knowledge, attitude and practice towards COVID-19. The survey questions were adapted from a research study conducted in the beginning of COVID-19 pandemic (Peng et al., 2020).

Knowledge of the respondents was measured through 5 questions. They were regarding infection type, transmission route, incubation period, high risk groups and main symptoms of COVID-19. These questions were in the form of single choice questions. An example of a knowledge question is stated below:

What type of infection is COVID-19? (Bacterial/ Viral [Correct]/ Fungal/ I don't know).

The knowledge scoring was done using a binary scale 0 & 1. Correct answer was allocated 1 point and incorrect answer or don't know response were assigned 0 points. The total knowledge score ranged from 0-5 where higher score signifies

better knowledge on COVID-19. Individuals scoring 4 and below were categorized as having inadequate knowledge and 5 was categorized as having adequate knowledge on COVID-19.

The attitude of the participants was assessed through 5 questions. They were regarding human to human transmission, impact on work or study, wild animal consumption, endurance to public health endurance and public health measures. These questions were also in the form of single choice questions. An example to access the attitude question is stated below:

Are you scared by human-to-human transmission? (No, I'm rational and I can protect myself [Positive] / Not really. I feel same as before the pandemic[Neutral] / Yes, I panic and don't know what to do [Negative])

The scoring system was similar to the previous section. Positive answer was given 3 points, neutral answer was assigned 2 points and negative answer was assigned 1 point. A total score ranged from 5-15. Individual scoring 7 and below were classified as having negative attitude, 8-11 were categorized as having neutral attitude and 12 and above were categorized as having positive attitude. Higher score signified positive attitude towards COVID-19.

Practice related to COVID-19 were assessed through 5 questions. They were regarding response towards symptoms, frontline rescue helpers, close contacts with confirmed cases, meet cured confirmed cases and priority after pandemic. These questions were also in the form of single choice questions. An example to access the practice question is stated below:

What would you do if you had a fever and dry cough? (I will analyze the situation rationally. Stay home for observation and self-quarantine or go to a hospital for a treatment [Proactive] / I want to go to a hospital, but I'm afraid to be infected [Neutral] / I will panic. I don't know what to do [Negative])

A similar scoring system was used. Proactive answer was allocated 3 points, neutral answer was assigned 2 points and passive answer was allocated 1 point. A total score ranged from 5-15, where 7 and below were categorized as having

passive practice, 8-11 were categorized as having neutal practice and 12 and above were categorized as having proactive practice towards COVID-19.

2.4.2. Quality of life

The respondents' quality of life was assessed using EUROHIS-QOL 8 item index questionnaire. This questionnaire is composed of 8 items: quality of life, health, energy, finance, daily life activities, esteem, relationships and living place. The response for each question was scored based on 5 point Liket Scale ranging from 1 (not at all) – 5 (completely). The overall quality of life score was considered poor (from 5-17), neutral (from 18-31) and good (from 32-45).

Respondents rated their general health on a 5 point scale that ranged from very dissatisfied (score 1) to very satisfied (score 5). They rated their energy and finance on a 5 point scale that ranged from not at all (score 1) to completely (score 5). They also rated their daily life activities, esteem, relationships and living place on a 5 point scale that ranged from very dissatisfied (score 1) to very satisfied (score 5).

These questions were in the form of single choice questions. A common scoring was performed to measure the quality of life questions. 5 points were given for very satisfied, 4 points for satisfied, 3 for neither satisfied nor dissatisfied, 2 points for dissatisfied and 1 point for very dissatisfied options. A total score of 5 – 45 was generated. Then the score was further divided in three sections for analysis, 1 was allotted for dissatisfied, 2 for neither satisfied nor dissatisfied and 3 for satisfied.

2.4.3. Source of information

This section of questionnaire collected data regarding source of information on what government is doing on COVID-19. The participants had to choose three main sources from the 10 different sources of information such as relatives, friends and neighbours, national newspaper, Radio/Television, Internet-Social media.

2.4.4. Covariance

The covariance consisted of socio-demographic characteristics such as age, gender (Male/ Female/ Others), marital status (Single / Married / Widowed / Divorced / In partnership but not married). Also, the respondents education level

(None / Certificate of secondary education or elementary school certificate / Vocational school certificate / Degree from a university / university of applied sciences / Master, technician or equivalent certificate / Doctorate /postdoctoral lecturing qualification / Other) and studying or working status in health/medical field (Yes / No / Not applicable) were asked. Furthermore, living arrangement (Apartment with Balcony / Apartment without Balcony / House / villa with a garden / House / villa without garden / Student Dormitory / Other), sharing of house hold (Family / Friends / Alone / Other) and total number of members living together were also inquired.

2.5. Ethical consideration

All the participants were informed that the data collected in this study will be confidential and used anonymously for academic purposes only. The participants proceeding to participate in the survey are considered to be willingly giving their consent.

2.6. Statistical analysis

The following chapter describes the statistical analyses. The data analysis was done using using a statistical program IBM SPSS Statistics Version 27.0. The statistical level of significance was set at $p<0.05$* and $p<0.01$** with 95% confidence interval.

Variables are described using measures of frequency, measures of central tendency and measures of distribution. Categorical variables are described in a table with frequency and percentage and continuous variable are presented with mean and standard deviation. Descriptive statistics were used to determine the socio-demographic characteristics of respondents and their knowledge, attitude and practice towards COVID-19.

Pearson's Correlation Coefficient was used to answer the first and third research question. Pearson's Correlation Coefficient is the most common measure of correlation that shows a linear relationship between two variables of interest. The values ranges between -1 (Negative Correlation) and +1 (Positive correation). Based on Cohen's standard, the correlation were interpretated as 0 = no

relationship, 0.10 - 0.29 = weak correlation, 0.30 - 0.49 = moderate correlation and 0.50 - 1.0 = high correlation (Cohen, 1988).

To answer the second research question independent T test or one way analysis of variance ANOVA test was used as appropriate.

“Independent T test” is a parametric test used to investigate the difference between two independent groups concerning one dependent variable (Field, 2013). Independent groups are categorical binary variable and dependent variables are ordinary or continuous variable. This test assumes; i) Dependent variable is normally distributed ii)The variance between the two groups are same as the dependent variable iii) Two population samples are independent of each other. For example, difference between gender concerning knowledge score. The level of significance was set to 95 % (p=0.05). The result in SPSS should be interpretated in the following way: if the p value for the Levene’s Test for Equality of Variances is less than the significance level (0.05) then the value of T test result is given in the row “Equal variance not assumed” (Field, 2013).

“One way analysis of variance or ANOVA” is a statistical test used to compare three or more independent group means. For example, influence of marital status on knowledge score. The level of significance was set to 95% (p=0.05).

3. Result

3.1. Survey sample description

A total of 338 responses were received from the survey. Out of these, 292 respondents answered the survey completely. Socio-demograhic characteristics of the surveyed respondents are presented in Table 1. There were 186 (63.7%) female and 106 (36.3%) male respondents. The age of participants ranged from 18 to 64 years, with a mean (SD) of 28.23 (8.343) years. Of the 292 respondents, 129 (44.2%) were single, 105 (36.0%) were in partnership but not married, 53 (18.2%) were married and 5 (1.7%) were widowed during the time of study. Among 292 participants, 127 (43.5%) had completed any form of university degree and 52 (17.8%) respondents had completed masters degree or equivalent degree. Slightly more than half of the respondents studied or worked in health/medical related field. Among all surveyed, 159 (54.5%) lived in an apartment with/without balcony, 61 (20.9%) stayed in house/villa with or without garden. The remaining resided in a student dormitory, parents house or town house. A total of 105 (36.0%) respondents reported living with their families, 58 (19.9%) participants were residing alone and remaining 129 (44.1%) stayed with their friends, flatmates, partners, random people or other students.

Table 1: Socio-demographic characteristics of participants (N = 292)

Variables	Mean (SD)	Frequency (%)
Gender		
Male		106 (36.3)
Female		186 (63.7)
Age	28.23 (8.343)	
Marital Status		
Single		129 (44.2)
Married		53 (18.2)
Partnership but not married		105 (36.0)
Widowed / Divorced		5 (1.7)
Highest Degree		
None		2 (0.7)
Secondary education or elementary school		16 (5.5)
Vocational school certificate		37 (12.7)
University / University of applied sciences degree		127 (43.5)

Master, technician or equivalent certificate		52 (17.8)
Doctorate / postdoctoral lecturing qualification		7 (2.4)
Others (Abitur, Medizinische Fachangestellte, Berufsausbildung, Ausbildung etc.)		51 (17.5)
Occupation		
Study or work in health/ medical field		152 (52.1)
Study or work in non-health/ non-medical field		140 (47.9)
Living arrangement		
Apartment with balcony		103 (35.3)
Apartment without balcony		56 (19.2)
House/villa with or without garden		61 (20.8)
Student dormitory		64 (21.9)
Others (parents' house, town house)		8 (2.8)
Household		
Family		105 (36.0)
Friends		61 (20.9)
Alone		58 (19.9)
Others (Flatmates, partner, students, random people)		68 (23.2)
Members	2.54 (3.695)	

3.2. Information sources for COVID-19

Of the 292 participants who answered the survey completely, 217 (24.77%) reported learning and staying up to date about COVID-19 by accessing general internet means, as shown in Figure 1. There were 178 (20.32%) people who reported obtaining information from radio/television and 150 (17.2%) respondents from relatives, friends, and neighbours. In this study, general internet, radio/television and relatives, friends and neighbours were mostly used as a source of information. By contrast, only 16 (1.83%) and 77 (8.79%) participants reported acquiring information about COVID-19 from political/community leaders or national newspapers.

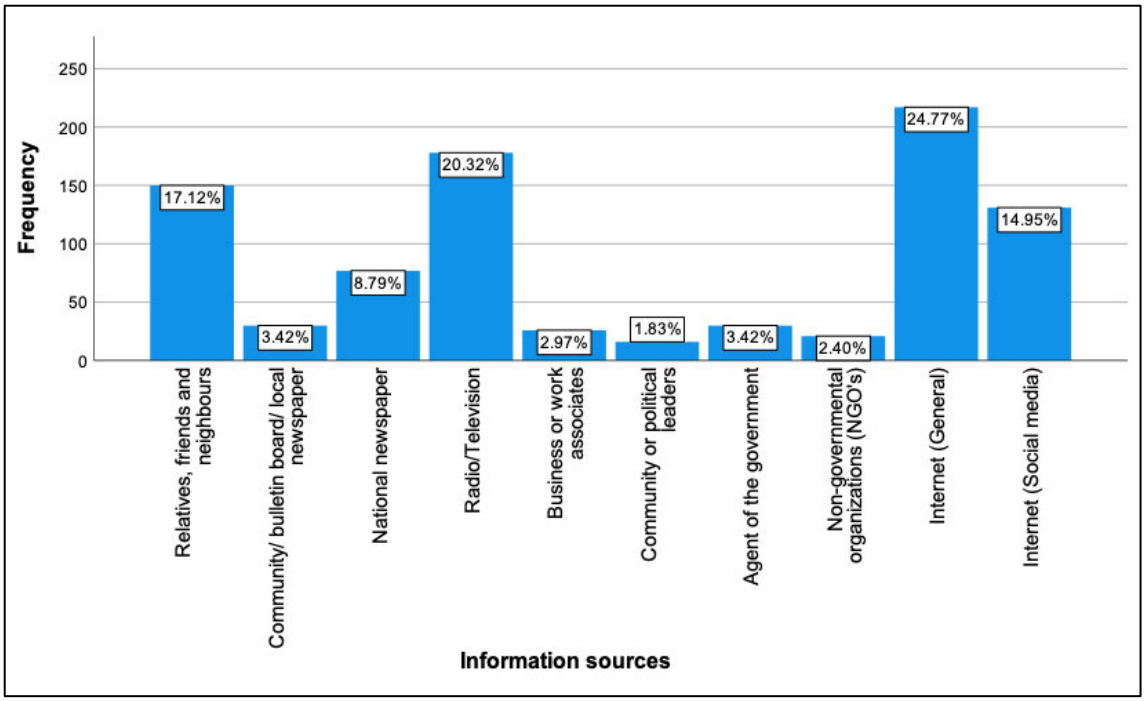

Figure 1: Bar plot of information sources for COVID-19 reported by respondents

3.3. Knowledge about COVID-19

Table 2 shows the respondents' knowledge on COVID-19. The mean (SD) of the knowledge score was 4.6 (0.58). Among the 292 respondents, 201 (68.8%) had adequate knowledge and 91 (31.2%) had inadequate knowledge on COVID-19 as shown in Figure 2. Majority of the respondents had good understanding on type of infection (96.6%), symptoms (92.5%), transmission route (99.7%) and risk group (98%). Whilst 17% of the respondents showed insufficient knowledge on incubation period of COVID-19 (Table 3).

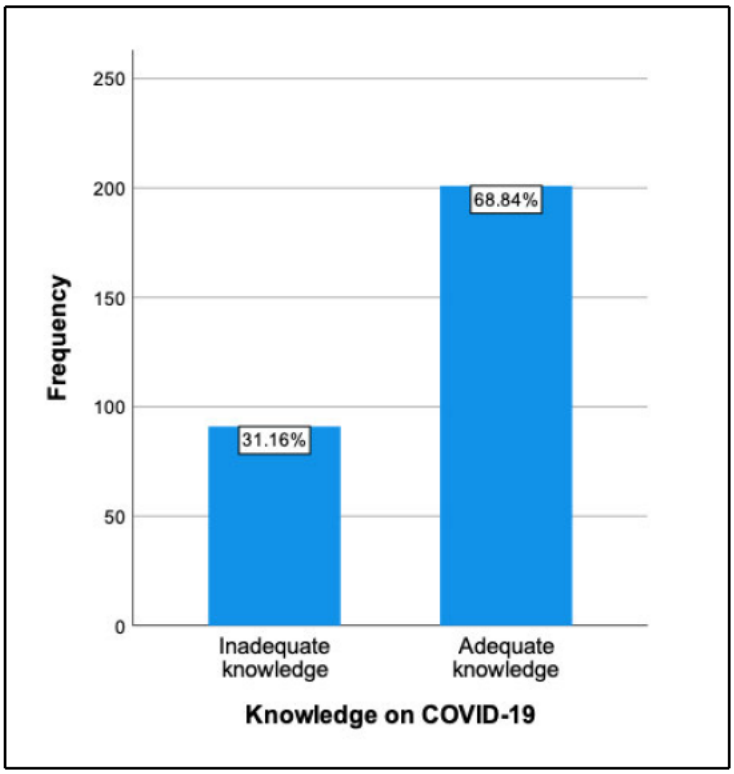

Figure 2: Bar plot of knowledge on COVID-19 among respondents

Table 2: Knowledge about COVID-19 among participants (N=292)

Questions	Options	N (%)
What type of infection is COVID-19?	Bacterial	8 (2.7)
	Viral	282 (96.6)
	Fungal	0 (0)
	I don't know	2 (0.7)
What is the main transmission route of COVID-19?	Respiratory droplets and close contacts	291 (99.7)
	Water	0
	Food	0
	I don't know	1 (0.3)
How long is the incubation period of the disease?	Less than 2 days	1 (0.3)
	2-5 days	57 (19.5)
	3-14 days	229 (78.4)
	I don't know	5 (1.8)
Which groups of people are at high risk of getting COVID-19 disease?	Older people and people with underlying medical conditions	286 (98)
	Pregnant women	0
	Children and adults	3 (1)
	I don't know	3 (1)
What are the main symptoms of COVID-19?	Fever and dry cough	270 (92.5)
	Tiredness	1 (0.3)

	Stuffy and running nose	4 (1.4)
	Sore throat and myalgia	12 (4.1)
	Diarrhea	1 (0.3)
	I don’t know	4 (1.4)

3.4. Attitude towards COVID-19

Table 3 shows the responses of participants attitudes towards COVID-19 using 5 questions. 77.74% of the subjects had neutral attitude towards COVID-19. In comparison, only 4.79% of the subjects had a negative attitude towards COVID-19, as shown in Figure 3. The mean (SD) of the attitude score was 11.15 (1.48). Slightly less than half (48.6%) of the participants think that they are capable of enduring such public health emergency in the future as shown in table 3. 252 (88.7%) respondents mentioned that the outbreak has not affected their work or study. However, 238 (81.5%) respondents hope to stop the outbreak quickly to get back to normal life.

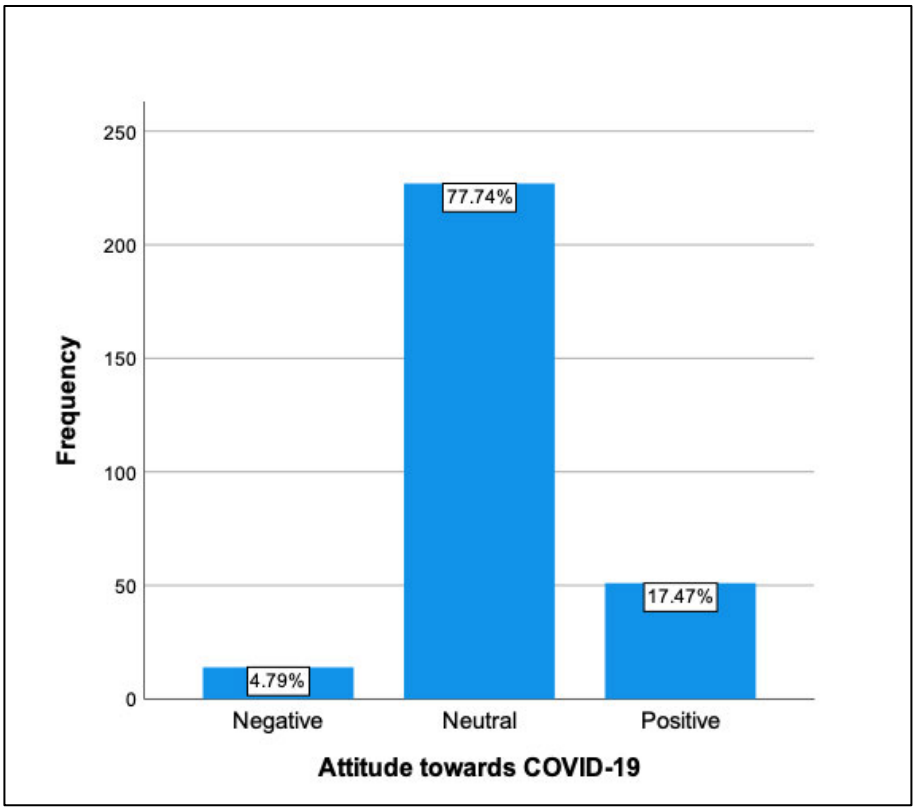

Figure 3. Bar plot of attitude towards COVID-19 among respondents

3.5. Practice related to COVID-19

Table 4 reveals responses of the participants regarding various practices using 5 questions. The mean (SD) of the practice score was 12.98 (1.44). Among the 292 respondents, 186 (63.70%) had proactive practice, and 101 (34.59%) had neutral practice related to COVID-19 as shown in Figure 4. 290 (99.3%) of the survey people reported that they will stay for home observation and self-quarantine or go to a hospital for treatment if they showed symptoms like fever and cough. There were 126 (43.2%) respondents that reported they will surely be helping the front line workers if the country needs them. By contrast, 10% of the respondents were not willing to help the frontline rescuers.

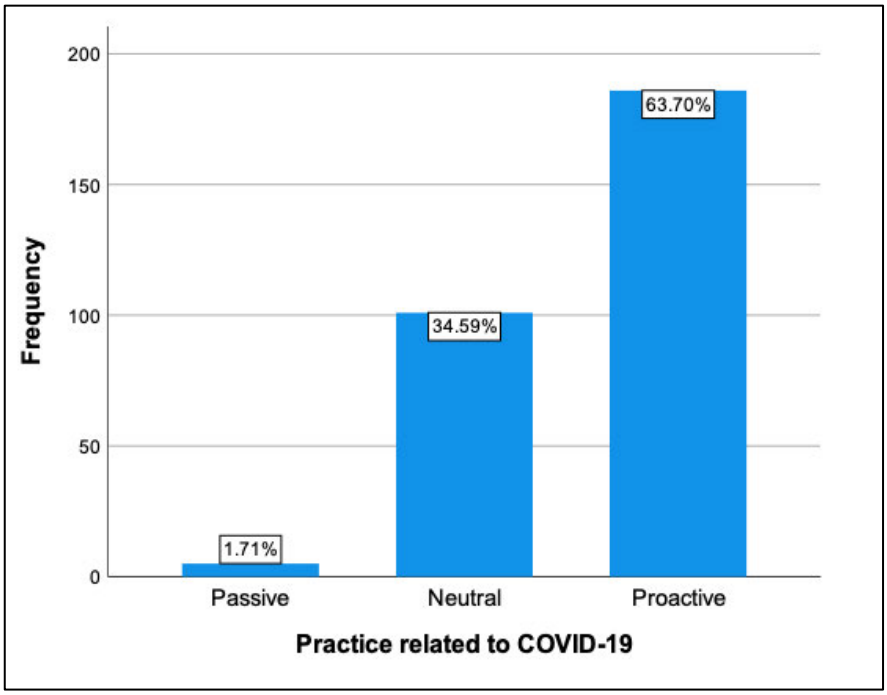

Figure 4: Bar plot of practice related to COVID-19 among respondents

Table 3: Attitude towards COVID-19 among respondents

Questions	Options	N (%)
Are you scared by human to human transmission?	No, I'm rational and I can protect myself	227 (77.7)
	Not really. I feel same as before the pandemic	42 (14.4)
	Yes, I panic and don't know what to do	23 (7.9)
Do you hope that the outbreak to stop quickly so that you can go back to your university/work?	Yes	238 (81.5)
	The outbreak has not really affected me	33 (11.3)
	No, I want to stay home as long as possible	21 (7.2)
What is your attitude towards the consumption of wild animals?	I don't eat wild animals, and I don't think other people should eat as well	96 (32.9)
	I don't eat personally, but I won't stop others	124 (42.4)
	I don't mind having a try	72 (24.7)
Do you think you will be more capable to endure such public health emergence in the future?	Yes, I'm well informed and thus more capable	142 (48.6)
	I will be the same	128 (43.8)
	No, I'm too scared to withstand it anymore	22 (7.5)
Do you think this outbreak has impacted your work or study?	Yes, it has	33 (11.3)
	No. I'm self-disciplined and my work/study was not affected	259 (88.7)

Table 4: Practice related to COVID-19 among respondents

Questions	Options	N (%)
What would you do if you had a fever and dry cough?	I will analyze the situation rationally. Stay home for observation and self-quarantine or go to a hospital for a treatment	290 (99.3)
	I want to go to a hospital, but I'm afraid to be infected	0
	I will panic. I don't know what to do	2 (0.7)
If the country needs you, are you willing to help the frontline rescue?	Yes certainly	126 (43.2)
	I'm not sure but I will consider it	135 (46.2)
	No, I won't	31 (10.6)
What would you do if you had close contact with confirmed cases?	Proactively report to the community and stay home in quarantine as required	280 (95.9)
	I will live like how I used to before	6 (2.1)
	I will panic because I don't know what to do	6 (2.1)
What would you do if someone cured of COVID-19 wanted to meet you?	I will meet them just like before	175 (59.9)
	I will be careful to meet them	105 (36.0)
	I will find an excuse to keep away from them	12 (4.1)
What will be your top priority when the pandemic ends?	I will go back and restart a normal life	162 (55.5)
	I will keep living like I used to during the pandemic	20 (6.8)
	The outbreak is too scary. I need to enjoy my life as much as possible	110 (37.7)

3.6. Quality of life

Table 5 shows the participants' responses on their quality of life using 8 questions. The descriptive statistics of quality-of-life data collected during the COVID-19 pandemic yielded a minimum score of 15 and a maximum score of 40. The quality-of-life median score was 29, and the range was 25. The mean (SD) of quality of life score was 28.49 (5.01). Out of 292 respondents, 185 (63.36%) participants had a good quality of life, and 94 (32.19%) survey people had neutral quality of life as shown in Figure 5. About 59% of the respondents were satisfied and 13.4% were neither satisfied nor dissatisfied with their health. 45.9% of the respondents reported that they were satisfied with their abilities to perform their daily activities. In comparison, 20.5% of participants were dissatisfied with their abilities to perform daily activities.

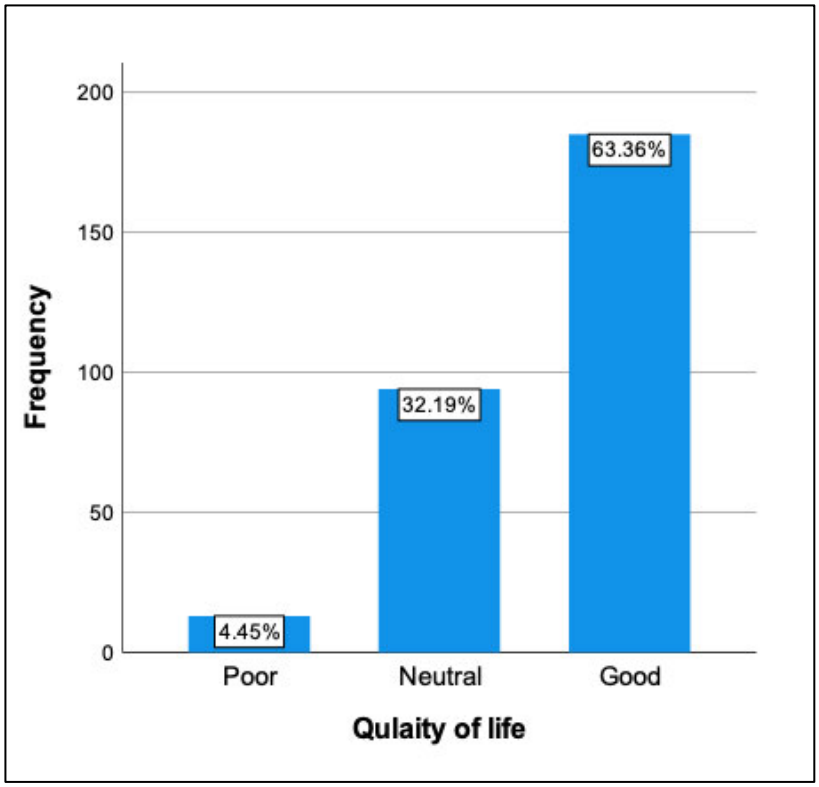

Figure 5: Bar plot of overall quality of life score among respondents

Table 5. Quality of life of respondents

Questions	Options	N (%)
How would you rate your quality of life?	Very poor	3 (1.0)
	Poor	28 (9.6)
	Neither poor nor good	83 (28.4)
	Good	150 (51.4)
	Very good	28 (8.6)
How satisfied are you with your health?	Very dissatisfied	3 (1.0)
	Dissatisfied	24 (8.2)
	Neither satisfied nor dissatisfied	39 (13.4)
	Satisfied	173 (59.2)
	Very satisfied	53 (18.2)
Do you have enough energy for everyday life?	Not at all	8 (2.7)
	A little	35 (12.0)
	Moderate	130 (44.5)
	Very much	78 (26.7)
	Completely	41 (14.0)
Have you enough money to meet your needs?	Very dissatisfied	10 (3.4)
	Dissatisfied	30 (10.3)
	Neither satisfied nor dissatisfied	114 (39.0)
	Satisfied	66 (22.6)
	Very satisfied	72 (24.7)
How satisfied are you with your ability to perform your daily living activities?	Very dissatisfied	7 (2.4)
	Dissatisfied	60 (20.5)
	Neither satisfied nor dissatisfied	65 (22.3)
	Satisfied	136 (46.6)
	Very satisfied	24 (8.2)
How satisfied are you with yourself?	Very dissatisfied	8 (2.7)
	Dissatisfied	50 (17.1)
	Neither satisfied nor dissatisfied	77 (26.4)
	Satisfied	128 (43.8)
	Very satisfied	29 (9.9)
How satisfied are you with your personal relationships?	Very dissatisfied	10 (3.4)
	Dissatisfied	41 (14.0)
	Neither satisfied nor dissatisfied	72 (24.7)
	Satisfied	134 (45.9)

	Very satisfied	35 (12.0)
How satisfied are you with the conditions of your living place?	Very dissatisfied	0
	Dissatisfied	31 (10.6)
	Neither satisfied nor dissatisfied	51 (17.5)
	Satisfied	139 (47.6)
	Very satisfied	71 (24.3)

3.7. Comparison of knowledge, attitude and practice score with socio-demographic characteristics

Table 6 depicts relationship between socio-demographic characteristics and knowledge score. Among the socio-demographic variables, gender ($p = 0.008$) of the respondents were significantly associated with mean knowledge score. Higher knowledge scores were obtained among male respondents. Table 7 shows association of various socio-demographic characteristics with attitude score. This study did not show any association between socio-demographic parameters and attitude score. Table 8 shows variation of practice score with socio-demographic characteristics. Variable that had a significant relationship with mean practice score were gender ($p<0.001$) and marital status ($p<0.001$). There was also a significant difference in the mean practice score between medical/health field workers or students and non-medical/non-health field workers or students ($p=0.021$). Higher practice scores were obtained among male respondents, being married and participants working or studying in medical/health related field.

3.8. Comparison of quality of life with socio-demographic characteristics

Table 9 depicts relationship between socio-demographic characteristics and quality of life score. Among, the socio-demographic variables, only gender ($p=0.02$) was significantly associated with quality-of-life score. Other parameters were not significant with QOL score in this study.

Table 6: Comparison of knowledge score towards COVID-19 by socio-demographic variables

Questions	Options	Knowledge Score		T/F value	P value
		Low n = 91	High n = 201		
Gender	Male (102)	27 (26.5%)	75 (73.5%)		
	Female (190)	64 (33.7%)	126 (66.3%)	1.294[t]	0.008 *
Age (in years)		27.96 ± 8.385	28.33 ± 8.281	1.200[f]	0.303
Marital Status	Single (133)	41 (30.8%)	92 (69.2%)		
	Married (53)	15 (28.3%)	38 (71.7%)		
	In partnership but not married (106)	35 (33%)	71 (67%)	0.188[f]	0.829
Highest Educational degree	None (2)	1 (50%)	1 (50%)		
	Certificate of secondary education or elementary school certificate (16)	5 (31.3%)	11 (68.8%)		
	Vocational school certificate (37)	11 (29.7%)	26 (70.3%)		
	Degree from a university/university of applied sciences (127)	44 (34.6%)	83 (65.4%)		
	Master, technician or equivalent certificate (52)	16 (30.8%)	36 (69.3%)		
	Doctorate/postdoctoral lecturing qualification (7)	2 (28.6%)	5 (71.4%)		
	Others (51)	12 (23.5%)	39 (76.5%)	0.409[f]	0.873

Work or study	Health/medical field (164)	48 (29.3%)	116 (70.7%)		
	Non-health/medical field (128)	43 (33.6%)	85 (66.4%)	0.790[t]	0.121
Living arrangement	Apartment with Balcony (103)	34 (33.0%)	69 (67.0%)		
	Apartment without Balcony (56)	15 (26.8%)	41 (73.2%)		
	House/villa with a garden (60)	21 (35.0%)	39 (65.0%)		
	House/villa without a garden (1)	0	1 (100%)		
	Student Dormitory (64)	19 (29.7%)	45 (70.3%)		
	Other (8)	2 (25.0%)	6 (75.0%)	0.342[f]	0.887
Sharing of household	Family (105)	31 (29.5%)	74 (70.5%)		
	Friends (61)	23 (37.7%)	38 (62.3%)		
	Alone (58)	15 (25.9%)	43 (74.1%)		
	Other (68)	22 (32.4%)	46 (67.6%)	0.713[f]	0.558

* p value < 0.05, t = T test from Independent Samples Test table, f = F test from ANOVA table

Table 7: Comparison of attitude score towards COVID-19 by socio-demographic variables

Question	Options	Attitude Score			T/F value	P value
		Negative n = 14	Neutral n = 227	Positive n = 51		
Gender	Male (102)	5 (4.9%)	81 (79.4%)	16 (15.7%)		
	Female (190)	9 (4.7%)	146 (76.8%)	35 (18.4%)	-0.518[t]	0.358
Age (in years)		27.21 ± 8.396	27.96 ± 8.134	29.65 ± 8.997	0.100	0.905
Marital Status	Single (133)	6 (4.5%)	102 (76.7%)	25 (18.8%)		
	Married (53)	3 (5.7%)	39 (73.6%)	11 (20.8%)		
	In partnership but not married (106)	5 (4.7%)	86 (81.1%)	15 (14.2%)	1.909	0.109
Highest Educational degree	None (2)	0	1 (50%)	1 (50%)		
	Certificate of secondary education or elementary school certificate (16)	1 (6.3%)	13 (81.3%)	2 (12.5%)		
	Vocational school certificate (37)	1 (2.7%)	30 (81.1%)	6 (16.2%)		
	Degree from a university/university of applied sciences (127)	6 (4.7%)	105 (82.7%)	16 (12.6%)		
	Master, technician or equivalent certificate (52)	0	36 (69.2%)	16 (30.8%)		
	Doctorate/postdoctoral lecturing qualification (7)	1 (14.3%)	5 (71.4%)	1 (14.3%)		
	Others (51)	5 (9.8%)	37 (72.5%)	9 (17.6%)	2.118	0.051

Work or study	Health/medical field (164)	9 (5.5%)	127 (77.4%)	28 (17.1%)		
	Non-health/medical field (128)	5 (3.9%)	100 (78.1%)	23 (18.0)	-0.461	0.862
Living arrangement	Apartment with Balcony (103)	6 (5.8%)	77 (74.8%)	20 (19.4%)		
	Apartment without Balcony (56)	0	45 (80.4%)	11 (19.6%)		
	House/villa with a garden (60)	7 (11.7%)	47 (78.3%)	6 (10.0%)		
	House/villa without a garden (1)	0	1 (100%)	0		
	Student Dormitory (64)	0	52 (81.3%)	12 (18.8%)		
	Other (8)	1 (12.5%)	5 (62.5%)	2 (25.0%)	1.726	0.128
Sharing of household	Family (105)	10 (9.5%)	80 (76.2%)	15 (14.3%)		
	Friends (61)	1 (1.6%)	51 (83.6%)	9 (14.8%)		
	Alone (58)	1 (1.7%)	45 (77.6%)	12 (20.7%)		
	Other (68)	2 (2.9%)	51 (75.0%)	15 (22.1%)	1.900	0.130

t = T test from Independent Samples Test table, f = F test from ANOVA table

Table 8: Comparison of practice score towards COVID-19 by socio-demographic variables

Questions	Options	Practice Score			T/F value	P value
		Passive n = 5	Neutral n = 101	Proactive n = 186		
Gender	Male (102)	0	29 (28.4%)	73 (71.6%)		
	Female (190)	5 (2.6%)	72 (37.9%)	113 (59.5%)	2.457[t]	<0.001*
Age (in years)		28.20 ± 10.895	27.26 ± 8.109	28.74 ± 8.337	0.086[f]	0.918
Marital Status	Single (133)	2 (1.5%)	34 (25.6%)	97 (72.9%)		
	Married (53)	0	9 (17.0%)	44 (83.0%)		
	In partnership but not married (106)	3 (2.8%)	58 (54.7%)	45 (42.5%)	13.231[f]	<0.001*
Highest Educational degree	None (2)	0	1 (50.0%)	1 (50.0%)		
	Certificate of secondary education or elementary school certificate (16)	0	5 (31.3%)	11 (68.8%)		
	Vocational school certificate (37)	1 (2.7%)	15 (40.5%)	21 (56.8%)		
	Degree from a university/university of applied sciences (127)	1 (0.8%)	47 (37.0%)	79 (62.2%)	2.124[f]	0.051

	Master, technician or equivalent certificate (52)	0	10 (19.2%)	42 (80.8%)		
	Doctorate/postdoctoral lecturing qualification (7)	0	2 (28.6%)	5 (71.4%)		
	Others (51)	3 (5.9%)	21 (41.2%)	27 (52.9%)		
Work or study	Health/medical field (164)	2 (1.2)	52 (31.7%)	110 (67.1%)		
	Non-health/medical field (128)	3 (2.3%)	49 (38.3%)	76 (59.4%)	1.426[t]	0.021*
Living arrangement	Apartment with Balcony (103)	1 (1.0%)	41 (39.8%)	61 (59.2%)		
	Apartment without Balcony (56)	1 (1.8%)	25 (44.6%)	30 (53.6%)		
	House/villa with a garden (60)	1 (7.6%)	22 (36.7%)	37 (61.7%)		
	House/villa without a garden (1)	0	0	1 (100%)		
	Student Dormitory (64)	1 (1.6%)	13 (20.3%)	50 (78.1%)		
	Other (8)	1 (12.5%)	0	7 (87.5%)	1.789[f]	0.115
Sharing of household	Family (105)	3 (2.9%)	35 (33.3%)	67 (63.8%)		
	Friends (61)	0	19 (31.1%)	42 (68.9%)		
	Alone (58)	1 (1.7%)	21 (36.2%)	36 (62.1%)		
	Other (68)	1 (1.5%)	26 (38.2%)	41 (60.3%)	1.900[f]	0.130

* p value < 0.05, t = T test from Independent Samples Test table, f = F test from ANOVA table

Table 9: Comparison of quality of life score by socio-demographic variables

Questions	Options	Quality of Life Score			T/F value	P value
		Dissatisfied n = 13	Neutral n = 94	Satisfied n = 185		
Gender	Male (102)	3 (2.9%)	29 (28.4%)	70 (68.6%)		
	Female (190)	10 (5.3%)	65 (34.2%)	115 (60.5%)	1.524[t]	0.02*
Age (in years)		26.77 ± 5.84	27.36 ± 7.64	28.75 ± 8.73	0.708[f]	0.493
Marital status	Single (133)	5 (3.8%)	49 (36.8%)	79 (59.4%)		
	Married (53)	2 (3.8%)	15 (28.3%)	36 (67.9%)		
	In partnership but not married (106)	6 (5.7%)	30 (28.3%)	70 (66.0%)	0.466[f]	0.628
Highest Education degree	None (2)	0	1 (50.0%)	1 (50.0%)		
	Certificate of secondary education or elementary school certificate (16)	2 (12.5%)	5 (31.3%)	9 (56.3%)		
	Vocational school certificate (37)	1 (2.7%)	16 (43.2%)	20 (54.1%)		
	Degree from a university/university of applied sciences (127)	3 (2.4%)	36 (28.3%)	88 (69.3%)		
	Master, technician or equivalent certificate (52)	3 (5.8%)	13 (25.0%)	36 (69.2%)	1.644[f]	0.135

	Doctorate/postdoctoral lecturing qualification (7)	1 (14.3%)	4 (57.1%)	2 (28.6%)		
	Others (51)	3 (5.9%)	19 (37.3%)	29 (56.9%)		
Work or study	Health/medical field (164)	7 (4.3%)	53 (32.3%)	104 (63.4%)		
	Non-health/medical field (128)	6 (4.7%)	41 (32.0%)	81 (63.3%)	0.081[t]	0.839
Living arrangement	Apartment with Balcony (103)	6 (5.8%)	25 (24.3%)	72 (69.9%)		
	Apartment without Balcony (56)	3 (5.4%)	20 (35.7%)	33 (58.9%)		
	House/villa with a garden (60)	1 (1.7%)	18 (30.0%)	41 (68.3%)		
	House/villa without a garden (1)	0	1 (100%)	0		
	Student Dormitory (64)	3 (4.7%)	26 (40.6%)	35 (54.7%)		
	Other (8)	0	4 (50%)	4 (50%)	1.033 [f]	0.399
Sharing of household	Family (105)	3 (2.9%)	32 (30.5%)	70 (66.7%)		
	Friends (61)	2 (3.3%)	20 (32.8%)	39 (63.9%)		
	Alone (58)	2 (3.4%)	20 (34.5%)	36 (62.1%)		
	Other (68)	6 (8.8%)	22 (32.4%)	40 (58.8%)	0.812 [f]	0.488

p value < 0.05, t = T test from Independent Samples Test table, f = F test from ANOVA table

3.9. Correlation between knowledge, attitude and practice

Correlation between KAP revealed weak positive linear correlations between knowledge and attitude (r = 0.153, p = 0.009), knowledge and practice (r = 0.209, p <0.001) and attitude and practice (r = 0.188, p = 0.001) as shown in Table 10. The correlation were interpreted using the following criterias: 0.10 - 0.29 = weak correlation, 0.30 - 0.49 = moderate correlation and 0.50 - 1.0 = high correlation (Cohen, 1988). The result reaffirms weak correlation between COVID-19 related knowledge, attitude and practice.

3.10. Correlation between KAP and QOL

The correlation revealed significant positive correlation between attitude and QOL (r = 0.113, p=0.027) as shown in Table 10. Other parameters like knowledge and practice were not significant with QOL. The result reaffirms weak correlation between COVID-19 attitude and QOL.

3.11. Correlation between KAP, QOL and different variables (Higher education and work or study)

The correlation revealed significant positive correlation between education status and attitude (r = 0.113, p = 0.026) and education status and practice (r = 0.148, p = 0.006). The result confirms weak correlation between COVID-19 attitude and education status and COVID-19 practice and education status. There was a weak positive correlation between COVID-19 practice and work or study (r = 0.130, p=0.013). Other parameters i.e knowledge, attitude and quality of life were not associated with work or study variable.

Table 10: Correlation between KAP, QOL, Higher education status and Work or study

			1	2	3	4	5	6
1	Knowledge	Pearson Correlation	1	.153**	.209**	-.075	.026	.015
		Sig. (1-tailed)		.004	.000	.100	.328	.398
		N	292	292	292	292	292	292
2	Attitude	Pearson Correlation	.153**	1	.188**	.108*	.113*	.003
		Sig. (1-tailed)	.004		.001	.033	.026	.477
		N	292	292	292	292	292	292
3	Practice	Pearson Correlation	.209**	.188**	1	.003	.148**	.130*
		Sig. (1-tailed)	.000	.001		.478	.006	0.013
		N	292	292	292	292	292	292
4	QOL	Pearson Correlation	-.043	.113*	.058	1	.068	.029
		Sig. (1-tailed)	.234	.027	.160		.123	.311
		N	292	292	292	292	292	292
5	Higher education	Pearson Correlation	.026	.113*	.148**	.068	1	-.002
		Sig. (1-tailed)	.328	.026	.006	.123		.484
		N	292	292	292	292	292	292
6	Work or study	Pearson Correlation	.015	.003	.130*	.029	-.002	1
		Sig. (1-tailed)	.398	.477	.013	.311	.484	
		N	292	292	292	292	292	292

** Correlation is significant at 0.01 level (2-tailed) * Correlation is significant at 0.05 level (1-tailed).

4. Discussion

4.1. Main findings

This thesis intended to assess the KAP towards COVID-19 among adults (18-64 years) in Hamburg and identify the socio-demographic variables that are associated with KAP about COVID-19. It also aimed to find out the association between KAP and QOL. The sample were mostly aware of corona virus disease, mostly exhibited neutral attitude and proactive practice towards COVID-19. The independent T test showed that gender was significantly associated with mean knowledge score. ANOVA test of significance and T test revealed significant difference in gender, work and marital status with mean practice score. The Pearson's Correlation Coefficient revealed that increased knowledge about corona virus disease was significantly associated with having positive attitude and proactive practice towards the disease. The study result also found that higher education status was significantly associated with having positive attitude and maintaining safe practices towards COVID-19. Moreover, work or study was also significant with COVID-19 practice. Lastly, Pearson's Correlation also presented having good quality of life is associated with positive attitude towards the disease.

4.2. Interpretation of result

Since the initial outbreak of COVID-19 on the 31st of December 2019, it has spread rapidly to become a major public health concern throughout the world. In Germany as well, different management policies have been imposed including national lockdown and quarantine by the government to slow the spread of the virus. It is vital to understand the KAP of the general population towards COVID-19 when implementing effective decision-making frameworks executed by the public health experts. Moreover, the assessment of KAP will help to address the knowledge of the disease among residents and will aid in development of various prevention strategies and health promotion programs. Since, COVID-19 is a novel viral disease, there has been limited study on how the general population receive and understand information regarding it. This is also true in case of the citizens of the city of Hamburg. Therefore, it is very important to timely investigate the KAP of adults in Hamburg to ensure effective prevention and control of virus transmission.

The survey conducted for this thesis shows that, out of 292 respondents, slightly more than two third had adequate knowledge on COVID-19. More than 90% of the respondents had significant knowledge on the infection type, transmission route, high risk groups and main symptoms of COVID-19. However, only 78.4% of the participants well recognized the COVID-19 incubation period. This level was low compared to a study conducted in Peru, which reported that 86% of respondents were knowledgeable about the incubation period (Zegarra-Valdivia et al., 2020). A survey in Bangladesh also reported that respondents had good knowledge on incubation period (86.2%) (Ferdous et al., 2020).

The residents of Hamburg exhibited adequate knowledge on COVID-19. The figures are higher than in previous studies on other infectious disease such as Ebola (Olowookere et al., 2015), H7N9 avian influenza (Chan et al., 2015) and SARS (Ferdous et al., 2020). This could be due to effective public health campaigns and health education mostly conveyed through non-medical sources such as internet and radio/television. In this study, 74.3% of the respondents reported learning and staying up to date about COVID-19 by using general internet means and 44.9% of the participants were accessing social media platforms to keep themselves updated about the disease. About 61% of the participants preferred radio/television to get information about the disease during pandemic. Moreover, public health education has been recognized as an effective means to prevent and control infectious disease.

The survey has shown that only 17.5% of the total respondents held a positive attitude towards COVID-19. This number was comparatively low to studies conducted in China, which reported that 73.81% (Peng et al., 2020) and 94.7% (Teng et al., 2021) of respondents held optimistic attitude towards COVID-19 epidemic. Around 77.7% of the respondents said that they were not scared by human-to-human transmission, 80% of the participants hoped the outbreak to stop quickly and 88.8% of the population thinks that the outbreak has not affected their work or study. However, only 32.9 % of the participants reported of not eating wild animals and think other people should not eat as well. Although majority of the respondents were well informed about COVID-19, more than half of them think that they were not capable to endure such public health emergence in future.

About 63.7% and 34.6% of the participants presented proactive practices and neutral practice towards COVID-19. It was interesting and encouraging to see that 99.3% of the respondents chose to analyze the situation rationally and stay home for observation and self-quarantine or go to hospital for treatment if they experience symptoms like fever and dry cough. While a similar KAP study conducted among UAE residents reported that only 93.2% of the participants chose to analyze the situation rationally if they experience respiratory symptoms (Lutfi et al., 2021). Nevertheless, in both studies 95% of the respondents chose to proactively report to the concerned authorities if they ever come in close contact with confirmed cases (Lutfi et al., 2021).

It was also demonstrated that there are some association between socio-demographic characteristics and adult's KAP score. Only gender variable was associated with good knowledge score. In contrast to this study, a study conducted in Tanzania showed that female gender, higher age, and higher education were significantly associated with higher knowledge score (Rugarabamu et al., 2020). Certain demographic groups such as male sex, age group of 16-29 years and lower education were significantly associated with lower knowledge score. Another KAP study conducted in Iran (Erfani et al., 2020) also exhibited similar findings to the study conducted in Tanzania. Based on other findings by (Erfani et al., 2020; Rugarabamu et al., 2020), it is evident that health education campaigns on COVID-19 knowledge should focus more on specific groups such as male, youth and people with lower education level.

This research did not find any association between socio-demographic characteristics and positive attitude score. While a study conducted in Iran showed that age, male gender, having lower level of education, unmarried and having higher number of households were significantly associated with having lower attitude towards COVID-19 (Erfani et al., 2020). However, another study did not show any significant association across gender and education levels (Rugarabamu et al., 2020). The survey also illustrates that; practice score was significantly associated with gender, marital status and work or study determinants. In contrast to this study's findings, a study conducted in Iran presented that age, male gender,

being single, working in health care setting and lower-level education were significantly associated with lower practice towards COVID-19 (Erfani et al., 2020).

Hamburg residents working or studying in health/medical field showed good and positive practices towards COVID-19. This could be explained by their unique training and experience in handling public health emergencies. However, having better practice towards COVID-19 among health and medical field respondents did not correlate with their knowledge and attitude towards the disease in this study. Knowledge is an essential component for developing positive attitudes and promoting preventive practices towards the disease (McEachan et al., 2016). Several other studies conducted among health care workers and medical students reported that knowledge directly affected their attitude and increased proactive practices during public health emergencies (Peng et al., 2020; Zhang et al., 2020).

According to the findings of present study, weak association between knowledge, attitude, and practice was revealed. Respondents with high level knowledge presented positive attitudes and were involved in proactive practices towards COVID-19. A similar KAP study on Hepatitis B revealed stronger association between knowledge, attitude, and practice (ul Haq et al., 2012). Another KAP study on COVID-19 reported moderate association between knowledge and attitude but weak correlation between knowledge-practice and attitude-practice (Desalegn et al., 2021). Result from a cross sectional study in Malaysia showed that most of the study respondents (83.1%) held positive attitudes towards the successful control of COVID-19 (Azlan et al., 2020). Also, another paper suggests that; among Chinese residents, higher knowledge score was significantly associated with lower likelihood of negative attitudes and risky preventive practices towards COVID-19 (Zhong et al., 2020).

It can be confidently deduced that better knowledge may result in more optimistic attitude and good practices, thus preventing and managing the spread of infectious disease effectively. Moreover, this thesis also showed that higher education status were significantly associated with a higher likelihood of having positive attitude and proactive practice towards the corona virus disease. Improving general population’s knowledge through proper health education programme is thus

important, bringing positive attitude and enhancing appropriate practice towards COVID-19.

The finding from this study also revealed that most of the respondents had good (63.4%) and neutral (32.2%) QOL. Whereas, a study from the kingdom of Saudi Arabia reported some population groups were more vulnerable to poor quality of life (Algahtani et al., 2021). Firstly, this could be because the study was conducted in the early phase of pandemic where people were not used to government restrictions such as social distancing and lockdown to lower the spread of the virus, thus having a negative influence on their QOL. Secondly, middle-aged male residents, who are usually the bread winner for their families were at higher risk of developing stress, anxiety, depression, and poor quality of life due to their demographic background, fear of losing a job and poor health during the COVID-19 pandemic. A web-based survey of 129 quarantined individuals during the 2004 SARS outbreak in Canada, Toronto also reported psychological distress and a sense of isolation due to lack of physical contact with family members and friends (Hawryluck et al., 2004). These finding clearly show that policy makers and health authorities should provide continuous psychological support to those in need especially in the start of pandemic than in the later phase to improve their psychological resilience and quality of life during pandemic.

This study also demonstrated that respondents who held positive attitude towards COVID-19 tend to have better quality of life. However, knowledge and practices towards COVID-19 were not significant with QOL.

4.3. Limitation

This study has some limitation. This study followed a cross-sectional study design where data collection was done at a specific point of time. Thus, it could not establish any evidence of causal inference between the variables. Also, a considerable limitation is the sampling method. Convenient sampling technique was used where mostly researchers' network group was contacted through Facebook, WhatsApp, and Email. This could possibly lead to selection bias.

Following the COVID-19 restrictions to limit the possible transmission of virus, the survey was conducted online. Thus, this survey was restricted to people with

internet access and population without internet access may not have been allowed to participate in this study. Therefore, it might not reflect the actual situation of whole Hamburg population, thus leading to sampling bias. Also, this study was conducted in the later phase of pandemic (around fourth wave) and not in the beginning of pandemic, thus providing a picture of present situation and limited insight on the early phase of pandemic.

EUROHIS-QOL questionnaire was used to assess the quality of life of the respondents. However, the quality of life of people before COVID-19 or in the early phase of COVID-19 were not assessed. In this way, the quality of life only during the time of study could be studied. Furthermore, the instrument used in this thesis was adapted from a previous research study conduced in China. However, a more through assessment of the instrument would have produced a more accurate and reliable instrument. And lastly, attitude and practice of the respondents could be assessed through other appropriate qualitative measures such as focus group and in-depth interviews instead of survey. This could provide more robust result to access their attitude and practice.

5. Conclusion

This thesis assessed three main objectives. These were firstly to explore the association between knowledge, attitude and practice toward COVID-19 among adults (18-64 years) in Hamburg Metropolitian City. Secondly, to examine the socio-demographic determinants on KAP score towards COVID-19. Finally, to investigate the association between knowledge, attitude and practice towards COVID-19 and quality of life.

The findings from this thesis suggests that Hamburg residents (18-64 years) had moderate knowledge, neutral attitude and proactive practice during the fourth wave of COVID-19 pandemic. In addition, higher knowledge were associated with having positive attitudes and proactive practices towards COVID-19. Also, results revealed that respondents working or studying in health/medical sector showed better practices towards COVID-19. This suggests that health education campaigns on COVID-19 are essential and therefore should be encouraged to improve the adult population's knowledge about the disease. This would not only raise awareness to help to control the disease but also bring positive attitude and maintain appropriate practice. This will go a long way to mitigate the ongoing pandemic. Moreover, the general populaiton should be trained by the public health experts to manage similar outbreak in the near future.

The study result has revealed overall good quality of life among majority of the respondents. Positive attitude towards COVID-19 were associated with having better quality of life. This result of the survey also strongly suggests that wellness programs should be implemented to deal with current pandemic to improve their quality of life. However, it shows that gender, marital status and work or study should be taken into consideration by the public health experts and authorities to ensure successful control of transmission of virus.

The result of the study can be used to improve future public health programs and educate the public about corona virus disease. However, the result of this study would need to be further confirmed with other studies due to various limitation such as restricted representation in the sample.

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7. Appendix

7.1 The Questionnaire

Welcome and thank you for your interest in my survey.

As a part of my master's thesis, I am conducting a survey regarding ongoing COVID-19 among adults (18-64 years) in Hamburg Metropolitan city.

This survey takes approximately 5-6 minutes to complete. Your data is completely protected as it will be collected and analyzed anonymously for academic purposes only.

I would appreciate taking your time to complete the following survey.

If you have any questions about the study, please feel free to contact: liza.tuladhar@haw-hamburg.de

Section A: Socio-demographic characteristics

A1. What is your gender?

- Male ☐
- Female ☐
- Others ☐
- Prefer not to say ☐

A2. How old are you?

☐☐☐☐☐☐☐☐☐

A3. Marital status

- Single ☐
- Married ☐
- Widowed ☐
- Divorced ☐
- In partnership but not married ☐

A4. What is your highest educational degree?

- [ ] None
- [ ] Certificate of secondary education or elementary school certificate
- [ ] Vocational school certificate
- [ ] Degree from a university/university of applied sciences
- [ ] Master, technician or equivalent certificate
- [ ] Doctorate/postdoctoral lecturing qualification
- [ ] Other

Other

A5. Do you study or work in a health/medical-related field?

- [ ] Yes
- [ ] No
- [ ] Not applicable

A6. How is your living arrangement?

- [ ] Apartment with Balcony
- [ ] Apartment without Balcony
- [ ] House/villa with a garden
- [ ] House/villa without garden
- [ ] Student Dormitory
- [ ] Other

Other

A7. With whom do you share your household?

- ☐ Family
- ☐ Friends
- ☐ Alone
- ☐ Other

Other

A8. How many members do you live with?

Section B: Source of information on COVID-19

B1. What are your THREE main sources of information regarding what the government is doing (such as information on COVID-19, workfare, family welfare, etc.)?

- ☐ Relatives, friends and neighbors
- ☐ Community/bulletin board/local newspaper
- ☐ National newspaper
- ☐ Radio/Television
- ☐ Business or work associates
- ☐ Community/political leaders
- ☐ An agent of the government
- ☐ Non-governmental organizations (NGOs) & International non-governmental organizations (INGOs)
- ☐ Internet - General
- ☐ Internet - Social media

Section C: Knowledge on COVID-19

C1. What type of infection is COVID-19?

- ☐ Bacterial
- ☐ Viral
- ☐ Fungal
- ☐ I don't know

C2. What is the main transmission route of COVID-19?

- ☐ Respiratory droplets and close contacts
- ☐ Water
- ☐ Food
- ☐ I don't know

C3. How long is the incubation period of the disease?

- ☐ Less than 2 days
- ☐ 2 to 5 days
- ☐ 3 to 14 days
- ☐ I don't know

C4. Which groups of people are at high risk of getting COVID-19 disease?

- ☐ Older people and people with underlying medical conditions
- ☐ Pregnant women
- ☐ Children and adults
- ☐ I don't know

C5. What are the main symptoms of COVID-19?

- ☐ Fever and dry cough
- ☐ Tiredness
- ☐ Stuffy and running nose
- ☐ Sore throat and myalgia
- ☐ Diarrhea
- ☐ I don't know

Section D: Attitude towards COVID-19

D1. Are you scared by human-to-human transmission?

- ☐ No, I'm rational and I can protect myself.
- ☐ Not really. I feel same as before the pandemic
- ☐ Yes, I panic and don't know what to do.

D2. Do you hope that the outbreak to stop quickly so that you can go back to your university/work?

- ☐ Yes
- ☐ The outbreak has not really affected me
- ☐ No, I want to stay home as long as possible

D3. What is your attitude towards the consumption of wild animals?

- ☐ I don't eat wild animals, and I don't think other people should eat as well
- ☐ I don't eat personally, but I won't stop others
- ☐ I don't mind having a try

D4. Do you think you will be more capable to endure such public health emergence in the future?

- ☐ Yes, I'm well informed and thus more capable
- ☐ I will be the same
- ☐ No, I'm too scared to withstand it anymore

D5. Do you think this outbreak has impacted your work or study?

- ☐ Yes, it has
- ☐ No. I'm self-disciplined and my work/study was not affected

Section E: Practice on COVID-19

E1. What would you do if you had a fever and dry cough?

- ☐ I will analyse the situation rationally. Stay home for observation and self-quarantine or go to a hospital for a treatment
- ☐ I want to go to a hospital, but I'm afraid to be infected
- ☐ I will panic. I don't know what to do

E2. If the country needs you, are you willing to help the frontline rescue?

- ☐ Yes certainly
- ☐ I'm not sure but I will consider it
- ☐ No, I won't

E3. What would you do if you had close contact with confirmed cases?

- ☐ Proactively report to the community and stay home in quarantine as required
- ☐ I will live like how I used to before
- ☐ I will panic because I don't know what to do

E4. What would you do if someone cured of COVID-19 wanted to meet you?

- ☐ I will meet them just like before
- ☐ I will be careful to meet them
- ☐ I will find an excuse to keep away from them

E5. What will be your top priority when the pandemic ends?

- ☐ I will go back and restart a normal life
- ☐ I will keep living like I used to during the pandemic
- ☐ The outbreak is too scary. I need to enjoy my life as much as possible

Section F: Quality of Life

Please choose the answer that appears most appropriate.

Keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life in the last four weeks.

F1. How would you rate your quality of life?

- ☐ Very poor
- ☐ Poor
- ☐ Neither poor nor good
- ☐ Good
- ☐ Very good

F2. How satisfied are you with your health?

- ☐ Very Dissatisfied
- ☐ Dissatisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Satisfied
- ☐ Very Satisfied

F3. The following questions ask about how completely you experience or were able to do certain things in the last four weeks.

	Not at all	A little	Moderate	Very much	Completely
Do you have enough energy for everyday life?	☐	☐	☐	☐	☐
Have you enough money to meet your needs?	☐	☐	☐	☐	☐

F4. How satisfied are you with ...

	Very Dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
...your ability to perform your daily living activities?	☐	☐	☐	☐	☐
...yourself?	☐	☐	☐	☐	☐
...your personal relationships?	☐	☐	☐	☐	☐
...the conditions of your living place?	☐	☐	☐	☐	☐

Thank you so much for taking part in the survey!!

7.2 Declaration

DECLARATION

I hereby declare that this master thesis entitled "**Knowledge, attitude and practice towards COVID-19 among adults (18-64 years) in Hamburg Metropolitan City**" has been carried out independently on my own under the guidance of Prof. Dr. Walter Leal and Dr. Adedeji Adekunle. I have explicitly cited all the direct or indirect sources used in this thesis as references.

Liza Tuladhar