Original Research Article

Level of Awareness Towards Covid-19 Recurrence Among Adults in Machakos County in Kenya

Abstract

Introduction: Cases of Covid-19 recurrence have become prevalent. This study seeks to establish the level of awareness towards Covid-19 recurrence among adults in Machakos County in Kenya. The study was guided by the health belief model and socio-ecological model.

Methods: The study design was a cross-sectional study. The study adopted a quantitative approach. The target population in this study was 7, 428 Covid-19 patients in Machakos County. The sample size for the study was 418 respondents. Purposive sampling was used in selecting the respondents for the study. Data was collected through a questionnaire.

Data analysis: Data was analyzed through descriptive statistics comprising of frequencies and percentages. Chi-Square test was used in determining the association between the independent and dependent variables of the study.

Results: From the findings, the overall Covid-19 recurrence was 11.1%. Overall knowledge, attitude and practice levels towards Covid-19 management and control were high. The study found that gender, level of education, engaging in any form of drugs/substance use and abuse and practices towards Covid-19 management and control were the significant host status determinants of Covid-19 recurrence. The study also found that staff shortages, proximity challenges and contaminated hospital environment were the significant facility determinants of Covid-19 recurrence. Further, it was evident from the study that the significant clinical determinants of Covid-19 recurrence included oxygen treatment for Covid-19, and longer duration in hospital during the first Covid-19 infection.

Conclusions and recommendation: The study recommends that the government should invest more in health facilities in terms of human resource for health personnel and equipment for treatment. The study recommends that future studies should be experimental so as to detect the actual biochemical concentrations for Covid-19 patients and recurrence rates among patients.

Keywords: Coronavirus SARS-CoV-2, Contagious Disease, Recurrence, Ministry of Health

Introduction

Host Status Determinants of Covid-19 Recurrence

Recurrence of an illness has been found to depend on host characteristics such as socio-demographic characteristics, health status and lifestyle among other personal factors. In China, Du *et al.,* (2021) demonstrated 2.4% of Covid-19 recurrence and found that among these patients, all of them were asymptomatic, had no interactions with other patients of Covid-19 and reported no family members who were afflicted. In South Korea, Kang (2020) reported a recurrence rate of 3.3% among the discharged patients, with the recurrence period ranging from one (1) to 35 days. Kang (2020) found recurrence to depend on age; most patients with recurrence were 20-29 years.

In a French study, Gousseff*et al.,* (2020) found recurrence of Covid-19 to occur in patients aged 19 years to 91 years, with recurrence occurring after being discharged from hospital, 4-27 days. All the patients in which recurrence had taken place were old patients and had comorbidities. Further, recurrence was also found to depend on acute respiratory infections and cases of heart failure. The study further found that patients with chronic diabetes during the initial diagnosis had higher risks of recurrence. Hussain *et al.,* (2020) is of the same opinion by demonstrating that the condition of the patient in terms of having other underlying conditions, for example, diabetes and hypertension, weakens the immune system further and therefore higher chances of recurrence. Wu and McGoogan (2020) showed that older patients have a higher likelihood of recurrence due to their lower immunity, weak clearance rates of the virus, chronic medical conditions and poor self-status of health.

Peng *et al.,* (2022) found recurrence rate to depend on gender; the rate was higher in women as compared to men. This finding is also found in a study by Liu *et al.,* (2021) and Wu *et al.,* (2021) who explained this outcome to be associated with sex hormones that act as significant immune response modulators leading to different reactions to re-infection. Sex steroids comprising of estrogens, androgens and progesterone effectively modulate the immune system. Therefore, differences in sex steroids concentrations between male and female has a high likelihood of influencing recurrence.

A systematic review by Sotoodeh Ghorbani *et al.,* (2022) demonstrated that Covid-19 recurrence varied with age. Further, the review demonstrated that comorbidity was prevalent in recurrent cases with the most prevalent conditions being diabetes, hypertension and chronic respiratory illnesses, liver conditions and cardiovascular diseases. Gidari *et al.,* (2021) conducted a systematic review on Covid-19 recurrence and found recurrence to occur at the same rate based on gender; however, there was a minor predominance of recurrence in females. The study further found recurrence not to

depend on age; however, recurrence depended on comorbidity with majority of the patients with recurrence demonstrating underlying illnesses.

A study by Melamed *et al.,* (2020) demonstrated that individuals engaging in substance use, misuse and abuse are more susceptible to infection and re-infection with Covid-19. Among the reasons cited is that substance use and abuse is associated with high prevalence of chronic illnesses. Further, acquisition of the drugs such as alcohol, cigarettes, heroin and cocaine among others calls for frequent visits to public places which may expose the persons. Substance use also calls for regular hand-to-mouth activities especially when smoking, sharing of equipment such as vaporizers and to some extent sharing the drugs and smoking paraphernalia such as the smoking pipes. Further, individuals indulging in drugs use and abuse frequently need to leave their home environment to take the drug and then re-enter thus exposing household members and themselves to Covid-19. Lastly, drugs use especially smoking suppresses functions of the respiratory system thus making users susceptible to infections of the respiratory system irrespective of the drugs being inhaled. Further, substance use and abuse also interferes with the response by the immune system as a result of overlapping pathways involving endocrine, neural and immune systems.

Statement of the Problem

Initially, Covid-19 was thought to be an immunizable and non-relapsing disease. However, current research is cumulatively suggesting this to be not the case. Initial assumptions related to immunity in addition to perception that the disease can be treated and prevented have led to delay in recognizing and understanding Covid-19 recurrence. Further, global policies towards the disease focused on containing the disease thus resulting in setbacks in recording and containing recurrence. Therefore, cases of Covid-19 recurrence have become prevalent (Veronica *et al.,* 2021).

Currently, most studies related to Covid-19 focus on characteristics related to epidemiological, clinical and pathological traits of the infected individuals. For instance, Jin *et al.,* (2020), Pan *et al.,* (2020), Chan *et al.,* (2020) and Wang *et al.,* (2020). Therefore, there is a deeper understanding of persons with initial infection of the virus. One emerging problem is the existence of patients with results that are re-detectable after treatment and discharge from hospitals. More attention in research should focus on patients with recurring Covid-19 position due to their infectivity capacity. Further, recurrent nature of Covid-19 is likely to lead to latent infection that normal Covid-19 tests may not temporarily detect. Subsequently, there is a prominent gap in recurrence of Covid-19 in terms of knowledge on determinants and the nature of recurrence. Until now, it has not been clear whether or not Covid-19 recurrences are rare exceptions. To fill the gap on knowledge of Covid-19 recurrence,

this study focuses on the determinants of Covid-19 recurrence among adults in Machakos County, Kenya.

Significance of the Study

The findings of this study are expected to be of significance to various parties involved in Covid-19 prevention and control such as the Ministry of Health and related organizations in addition to other non-government organizations in the health sector. The findings of the study will contribute to the understanding of determinants of Covid-19 recurrence in Kenya and thus help in managing its re-occurrence. The study will further shed light on whether the strategies and control measures that the government has put in place to manage Covid-19 consider preventing recurrence and thus spread of the disease. It is also expected that the study will be of great benefit to academicians and scholars. The study is expected to contribute to existing literature on Covid-19 recurrence that is emerging especially in developing countries. This will form a basis upon which future research by other academicians, scholars and researchers will be based.

Method

The study design was a cross-sectional study. The study adopted a mixed methods approach. Under a mixed methods approach, quantitative and qualitative approaches are both utilized. The emphasis for quantitative approach is on objective measurement of the study's variables to obtain numerical data; afterwards, statistical or mathematical methods are adopted in analyzing the quantitative data obtained. This study was conducted in four selected Sub-Counties of the Machakos County in Kenya, namely, Mavoko Sub-County, Kangundo Sub-County, Kathiani Sub-County and Mwala Sub-County in Machakos County in Kenya respectively. The total population of Machakos County is 1,421,932 with 264,500 households according to Kenya population censors of 2019 (KBS, 2019) and lies at 6,208 SQ KM.

Study Population

In this study, the study population comprised of Covid-19 patients in Kenya. Based on the Ministry of Health (2022), there were 322, 500 Covid-19 infections in Kenya by March 31, 2022.

Target Population

Mugenda and Mugenda (2012) define a target population as a subset of the study population from which the researcher intends to gather data from and draw conclusions from. The target population comprises of elements with similar characteristics that the researcher intends to study. The target population in this study was 7, 428 Covid-19 patients in Machakos County based on Ministry of Health (2022) data.

To obtain a sample size, Yamane (1967) was utilized. From the calculation, the sample size for the study was therefore approximately 380 Covid-19 patients selected from Mavoko Sub-County, Kangundo Sub-County, Kathiani Sub-County and Mwala Sub-County in Machakos County in Kenya. An additional 10% of non-responses was added to the study bringing the entire sample size to 418 respondents.

Collection of quantitative data was done using structured questionnaires. Focused groups discussions (FGDs)of (2 groups of 5 participants in each group) which incorporated mature multifarious adults were involved in discussions to gather qualitative data based on their experiences with regards to COVID-19 recurrence in the four selected sub-counties of Machakos County in Kenya. The FGDs comprised of healthcare personnel comprising of 1 doctor, 1 nurse, 1 public health professional, 1 community health worker and 1 clinical officer per group

Inclusion Criteria

The research participants who were included in the study were adult who had covid-19 infection and were residents of Machakos County. The research participants who agreed and signed the consent form formed part of the respondents. The research participants who were selected to take part were of sound mind and have the ability to take instructions.

Exclusion Criteria

Participants below 18years of age were excluded in the research and any other person who had not tested positive for Covid-19. Any respondent who did not sign the consent form and was not a resident of Machakos County as per the prescribed period in the inclusion criteria was excluded in the research.

Ethical Considerations

To guarantee that the research adhere to ethical issues, first the research sought an approval letter from Mount Kenya University Institutional Ethics Review Committee. Also a letter of introduction from Mount Kenya Graduate School was obtained detailing the student information and the purpose of the research. This letter was of great importance in enabling the research to obtain the necessary research permits from NACOSTI and from Machakos County authority. The research participants that was willing to participate in the research was required to sign a consent form. The participants were guaranteed of the confidentiality of the data they was sharing during the research period.

Research Findings

Awareness Level of the Respondents towards Covid-19

Level of awareness was evaluated in terms of KAP towards Covid-19 management, control and treatment.

Knowledge of the Respondents towards Covid-19

Respondents were presented with 13 questionnaire items regarding knowledge towards Covid-19. For each correct response, 1 mark was awarded while 0 mark was awarded for an incorrect response. The findings are shown in Table 1.

Table 1: Correct Rate on Knowledge Items

	Correct Rate	
	Frequency	Percent (%)
Covid-19 is an infection of the respiratory system caused by a species in the coronavirus family	344	91.0%
Covid-19 first case was detected in China's City of Wuhan	320	84.7%
Covid-19 origin is unclear but there are perceptions that transmission to humans is through consumption of sea foods, from bats or snakes	306	81.0%
Common symptoms of Covid-19 include fever, coughing, breath shortness; diarrhea and nausea were rarely reported	328	86.8%
Covid-19 period of incubation is up to 14 days with 5 days being the mean	304	80.4%
Diagnosis of Covid-19 is through PCR test on samples obtained from nasopharyngeal and oropharyngeal discharge; sputum and bronchial washing can also be used to obtain samples	264	69.8%
Covid-19 is transmitted through droplets of the respiratory such as sneeze and cough droplets	353	93.4%
Covid-19 is transmitted through coming into close contact with infected persons in family, health facilities and crowded places	355	93.9%
Covid-19 can be prevented through hand washing with soap and maintaining personal hygiene	332	87.8%
A medical mask can appropriately prevent respiratory droplets from spreading during coughing	319	84.4%
Covid-19 can be prevented through maintaining social distance, no close contacts, for instance handshakes, kissing, avoiding meetings etc. It can also be prevented through frequent disinfection	345	91.3%
All persons in the society should be in masks (R)	308	81.5%
The usual antiviral drugs can be used to treat Covid-19 (R)	280	74.1%

*R shows items that were reverse coded

Source: Primary Data

From the self-reported knowledge responses, 91.0% (344) of the respondents correctly defined Covid-19 as a respiratory system infection caused by a species of the coronavirus family. Further, 84.7% (320) correctly indicated the origin of Covid-19 as Wuhan, China. Additionally, majority of the respondents, 81.0% (306), correctly indicated the transmission path of Covid-19 to comprise of transmission through consumption of sea foods, from bats or snakes. It is also evident that majority of the respondents as shown by 86.8% (328) correctly indicated the symptoms of Covid-19 to include fever, coughing, breath shortness, diarrhea and nausea. Table 4 also show that 80.4% (304) of the respondents correctly indicated the incubation period of Covid-19 to be up to 14 days with the mean incubation being 5 days.

It can also be seen from the results that 69.8% (264) of the respondents were correct on the diagnosis of Covid-19 through PCR test on samples obtained from nasopharyngl and oropharyngeal discharge, sputum and bronchial washing. Majority of the respondents, 93.4% (353) indicated correctly that Covid-19 transmission is through droplets of the respiratory such as sneeze and cough droplets. Further, 93.9% (355) were correct that Covid-19 is transmitted through contact with infected persons; 87.8% (332) were correct that Covid-19 can be prevented through hand washing with soap and maintaining personal hygiene. Of the total respondents, 84.4% (319) were correct that a medical mask can appropriately prevent respiratory droplets from spreading during coughing. Table 4 demonstrated that 91.3% (345) of the respondents were correct on prevention of Covid-19 through social distancing, no close contacts and through frequent disinfection. The results further demonstrate that 81.5% (308) of the respondents were correct on the statement that "all persons in the society should be in masks". This item was reverse coded to reflect the correct answer that was "False". Lastly, 74.1% (280) of the respondents were correct on the statement that "The usual antiviral drugs can be used to treat Covid-19". This item was reverse coded to reflect the correct answer of "False". Based on the responses on knowledge towards Covid-19, the item on Covid-19 diagnosis had the lowest correct rate.

The knowledge scores were aggregated, and then converted into percentage so as to develop a knowledge scale. The average knowledge score was 84.62% (standard deviation=9.67). The minimum score was 61.54% while the maximum score was 100.00% (see Table 2).

Table 2: Summary Statistics for Percentage Scores on Knowledge

Mean	84.6154
Mode	84.62
Std. Deviation	9.67184

Minimum	61.54
Maximum	100.00

Source: Primary Data

The respondents were then categorized based on different knowledge levels as guided by Taghrir, Borazjani and Shiraly (2020) who indicated that a total score of 75% and above reflect high knowledge, a score of between 50%-75% represent moderate knowledge while a score below 50% is low knowledge level. Based on Table 4, a larger portion of the respondents as shown by 88.1% (333) had high knowledge levels towards Covid-19; 11.9% (45) had moderate knowledge levels. None of the respondents had low knowledge levels (see Table 3).

Table 3: Overall Knowledge Levels

		Frequency	Percent (%)
Knowledge Levels	High Knowledge Level	333	88.1%
	Moderate Knowledge Level	45	11.9%
	Low Knowledge Level	0	0.0%

Source: Primary Data

The findings agree with the responses from the FGDs. For instance, a respondent in FGD 1 was of the opinion that:

> "From the patients that I have interacted with, there seem to be high knowledge in terms of how Covid-19 is transmitted. Patients are also knowledgeable in terms of Covid-19 prevention through handwashing with clean water and soap"

Another participant in the FGD depicts patients to be knowledgeable in terms of prevention through social distancing and wearing of protective masks. This is based on the opinion below:

> "Patients are always in masks. This is a clear sign that they know that the masks can prevent them from coming into contact with droplets especially from other people's cough"

Another respondent from FGD 2 stated that:

> "Patients seem to be aware on prevention through social distancing as evidenced on how they behave when they visit the clinics. They adhere to queuing guidelines that maintain social distancing"

Another respondent from FGD 2 supports patients being knowledgeable on Covid-19 symptoms by stating that:

> "When I am attending the Covid-19 patients, they are able to list some of the symptoms that are associated with Covid-19 such as fever, shortness of breath and coughing. They

are in most cases able to differentiate normal cough and fever with cough and fever associated with Covid-19"

Attitude towards Covid-19

Respondents were also presented with self-rating questions regarding their attitude towards Covid-19. A positive response perceived positive attitude towards Covid-19, while a negative response perceived negative attitude towards Covid-19. The findings are as shown in Table 4.

Table 4: Correct Rate on Attitude Items

	Negative Attitude		Positive Attitude	
	Frequency	Percent (%)	Frequency	Percent (%)
I am scared by human-to-human Covid-19 transmission	60	15.9%	318	84.1%
I hope the outbreak stops quickly so that I return to normal livelihood	40	10.6%	338	89.4%
I eat wild animals	5	1.3%	373	98.7%
I will be more capable to endure public health emergence of Covid-19 magnitude	75	19.8%	303	80.2%
This outbreak has impacted my daily lifestyle and livelihood	166	43.9%	212	56.1%

Source: Primary Data

From the findings in Table 4, it is evident that positive attitude was present in 84.1% (318) of the respondents on being scare by human-to-human Covid-19 transmission. Additionally, 89.4% (338) of the respondents had a positive attitude on the perception that the pandemic stops quickly so that they return to their normal livelihood; 98.7% (373) had a positive attitude on eating wild animals; 80.2% (3030) had a positive attitude on being more capable to endure public health emergence of Covid-19 magnitude and 56.1% (212) had a positive attitude on how the pandemic has impacted their daily lifestyle and livelihood.

The attitude score of the participants was determined by summing the scores for each of the items and converting them into percentages. The findings show that the average attitude score was 81.69% (standard deviation=18.23), with the mode being 100.0%. The minimum attitude score was 20.0% while the maximum was 100.0% (see results in Table 5).

Table 5: Summary Statistics for Percentage Attitude Score

Mean	81.6931
Mode	100.00
Std. Deviation	18.23196
Minimum	20.00
Maximum	100.00

Source: Primary Data

Similarly, the rating by Taghrir*et al.,* (2020) was adopted to categorize the respondents based on their attitude levels. A score of 75% and above represented good attitude, a score between 50%-75% represented moderate attitude while a score below 50% represented low attitude towards Covid-19. Overall, 72.8% (275) of the respondents had a high positive attitude, 23.3% (88) had a moderate attitude while 4.0% (15) had a low attitude score (negative attitude) (see Table 6).

Table 6: Overall Attitude Levels

	Frequency	Percent (%)
High Attitude	275	72.8
Moderate Attitude	88	23.3
Low Attitude	15	4.0
Total	378	100.0

Source: Primary Data

The FGDs were in support of a change in attitude by the respondents in terms of the impact the pandemic has had in their daily activities and livelihood. For instance, a respondent in FGD 2 stated that:

"Most people have changed their attitude since the pandemic impacted their normal livelihoods. For most patients, they have not been able to return to their normal lives and have changed their way of doing things and handling a pandemic. Some have even changed their work schedules and to some extent their nature of work in response to the changes brought about by the pandemic"

Practices towards Covid-19 Control, Management and Treatment

Respondents were also required to self-report on some practices regarding Covid-19 management, control and treatment. A correct response was awarded 1 mark while an incorrect response was awarded 0 mark. The findings are as reported in Table 7.

Table 7: Correct Rate on Practices towards Covid-19 Control, Management and Treatment

	Correct Rate	
	Frequency	Percent (%)
I cancelled socialization events, meetings, sporting activities or any other form of social gathering cancelled socialization events, meetings, sporting activities or any other form of social gathering	331	87.6%
I minimized using public transport services	277	73.3%
I reduced the frequency of shopping	234	61.9%
I minimized using closed spaces such as churches, library and theaters	307	81.2%
I avoid coughing around other persons as much as possible	277	73.3%
I avoid where there is a large number of gathering people	335	88.6%
I increased the cleaning and disinfecting frequency of items that are easily touched by hand	308	81.5%
I wash hands more often than usual	301	79.6%
I have increased discussions related to Covid-19 prevention with close people such as family and friends	341	90.2%

Source: Primary Data

From the results reported in Table 7, 87.6% (331) of the respondents had a correct response on cancellation of socialization events, sporting activities or any form of social gathering; 73.3% (277) correctly responded on minimization of using public transport services; 61.9% (234) correctly responded on reducing shopping frequency. Further, the findings show that 81.2% (307) of the respondents had a correct response minimization of using closed spaces such as churches, library and theaters. The study also showed that 73.3% (277) of the participants avoided coughing around other persons as much as possible; 88.6% (335) avoided where there is a large number of gathering people; 81.5% (308) increased the cleaning and disinfecting frequency of items that are easily touched by hand; and 79.6% (301) washed hands more often than usual. Lastly, 90.2% (341) increased discussions related to Covid-19 prevention with close people such as family and friends.

The responses by the FGDs support most of these findings related to practices towards Covid-19. For instance, discussions based in FGD 1 demonstrated practices towards use of disinfectants and washing of hands. This evident from a response by one participant who noted that:

"There has been an increase in handwashing points even in public spaces. I have also witnessed patients carrying disinfectants in their handbags and pockets unlike before the pandemic"

Another respondent was in favour of reduced gatherings in public spaces and avoidance of social gatherings by noting the following:

"In this area, there have been reduced social events such as weddings, birthday parties and political meetings in response to the pandemic. For the patients that I have been handling, most of them have disclosed reducing outdoor activities so as to prevent further spread of the disease"

The overall practice score was determined by obtaining the total score for the responses on practices related to Covid-19 control, management and treatment and getting a percent. The mean score for the practices was 79.69% (standard deviation=15.33); the minimum score was 44.44%, maximum score was 100.0% and the mode was 88.89% (see Table 8).

Table 8: Summary Statistics on Percentage Practice Levels towards Covid-19 Control, Management and Treatment

Mean	79.6884
Mode	88.89
Std. Deviation	15.33188
Minimum	44.44
Maximum	100.00

Source: Primary Data

Through Taghri*et al.,* (2020), level of practices was categorized into whether it was poor or good practice. A total score of 75% and above reflected good practice while a score less than 75% reflected poor practice that would expose the respondents to Covid-19. Based on findings, 71.7% (271) of the respondents had good practices towards Covid-19 management and control; 28.3% (107) had poor practices (see Table 9).

Table 9: Overall Practice Levels towards Covid-19 Control, Management and Treatment

	Frequency	Percent (%)
Good Practice	271	71.7
Poor Practice	107	28.3
Total	378	100.0

Source: Primary Data

Conclusions

Based on the self-reported knowledge scale, majority of the respondents were in agreement with the knowledge items presented to them. Most items on knowledge had a correct rate of 80% such as items related to origin of Covid-19, Covid-19 transmission path, symptoms of Covid-19, incubation period, transmission through droplets, transmission through contact, prevention through hand washing and personal hygiene, prevention through wearing a medical mask, prevention through social distancing and no close contacts, persons who should wear masks, and treatment through antiviral drugs. However, a lower correct rate was note on the knowledge item related to Covid-19 diagnosis through PCR tests on samples obtained from nasopharyngl and oropharyngeal discharge, sputum and bronchial washing. The overall knowledge levels were high with no respondents demonstrating low knowledge levels.

From the findings on attitude levels, positive attitude was demonstrated on items related to being scared by human-to-human transmission, perception that the pandemic should end quickly to return to normal livelihoods, consumption of wild animals, and endurance of public health emergence of the same magnitude as Covid-19. However, the attitude item on how the pandemic has impacted the lives of the respondents had a lower perceived attitude by the respondents. Overall, majority of the respondents had a high positive attitude towards Covid-19. For practices towards Covid-19 management and control, majority of the respondents had good practices on social gatherings and social events, use of public transport services, use of closed spaces, coughing around other persons, avoidance of crowded places, cleaning and disinfecting frequency, washing hands, and discussions related to Covid-19 prevention. Based on the findings, majority of the respondents had good practices towards Covid-19 management and control.

From the findings of the study, it can be concluded that there were traces of Covid-19 recurrence among patients as a result of several determinants related to host characteristics, facility factors and clinical factors.

Recommendations for Policy

Based on the study's findings, it was found that facility factors such as staff shortages, proximity challenges and contaminated hospital environment determine Covid-19 recurrence in Kenya. Therefore, the government should invest in training Covid-19 diagnosis, treatment, management and control. The government should also invest in recruiting more staff in the health sector to avoid straining the already existent health care workers when a pandemic of Covid-19 magnitude occurs. The government should also invest in the construction of specialized units for Covid-19 to avoid

admitting Covid-19 patients in the same facilities with other patients. This will help reduce recurrence and re-infection through contaminated hospital environment. Though KAP levels were high, the government and other stakeholders should continue with their awareness campaigns to further raise these levels. Continuous awareness campaigns will ensure that citizens are continuously aware of the measures and practices that they should engage in or avoid so as to minimize infections.

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