

Analysis of Prevention of COVID-19 Transmission Measures in People with HIV-AIDS at Jumpandang Baru Public Health Center, Makassar City

Análisis de las medidas de prevención de la transmisión de COVID-19 en personas con VIH-SIDA en el centro de salud pública de Jumpandang Baru, ciudad de Makassar

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SUMMARY

Considering the COVID-19 pandemic, people with HIV-AIDS are a population that more likely to be immunosuppressed require more attention. People living with HIV-AIDS (PLWHA) are advised to take the same precautions as the general public, including frequent hand washing, coughing etiquette, physical distancing, mask use, and medical attention in the event of symptoms. This study seeks to identify the factors associated with the prevention of COVID-19 transmission among HIV-positive patients at the Jumpandang Baru Public Health Center in Makassar. The research method used was analytic observational with a cross-sectional research design. The total

number of participants in this study was 659 HIV-AIDS patients receiving antiretroviral (ARV) therapy. 188 individuals were chosen as the research sample in the working area of the Jumpandang Baru Public Health Center in Makassar City. Simple random sampling was used for the sampling process. The data were analyzed using SPSS, the Chi-square test, and logistic regression.

The results showed that the variables associated with COVID-19 prevention measures in PLWHA, were knowledge ($p=0.001$), attitude ($p=0.003$), vaccination ($p=0.022$), and ARV treatment ($p=0.038$). However, the family social support variable ($p=0.038 = 0.162$) had no significant relationship. The most related factor is knowledge $Exp(B) = 5.613$. Those with HIV-AIDS who have positive knowledge are 5.613 times more likely to take precautions against COVID-19 than

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those with HIV-AIDS who have negative knowledge. The conclusion is that health workers can participate and collaborate in increasing knowledge in the application of health protocols so that people with HIV-AIDS can be protected from COVID-19.

Keywords: COVID-19, HIV-AIDS, preventive measures.

RESUMEN

Ante la pandemia del COVID-19, las personas con VIH-SIDA son una población con mayores probabilidades de estar inmunodeprimido y requerir más atención. Se recomienda a las personas que viven con el VIH-SIDA (PVCVS) que tomen las mismas precauciones que el público en general, incluido el lavado frecuente de manos, la etiqueta al toser, el distanciamiento físico, el uso de máscaras y la atención médica en caso de síntomas. Este estudio busca identificar los factores asociados con la prevención de la transmisión de COVID-19 entre pacientes VIH positivos en el Centro de Salud Pública Jumpandang Baru en Makassar.

El método de investigación utilizado fue analítico observacional con un diseño de investigación transversal. El número total de participantes en este estudio fue de 659 pacientes con VIH-SIDA que recibían terapia antiviral (TAV). Se tomaron muestras de 188 individuos en el área de trabajo del Centro de Salud Pública Jumpandang Baru en la ciudad de Makassar. Para el proceso de muestreo se utilizó un muestreo aleatorio simple. Los datos fueron analizados utilizando el SPSS, la prueba de Chi-cuadrado y regresión logística,

Los resultados mostraron que las variables asociadas a las medidas de prevención de COVID-19 en PVCVS fueron conocimiento ($p=0,001$), actitud ($p=0,003$), vacunación ($p=0,022$) y tratamiento ARV ($p=0,038$). Sin embargo, la variable apoyo social familiar ($p=0,038$) = 0,162 no tuvo relación significativa. El factor más relacionado es el conocimiento Exp (B) = 5,613. Las personas con VIH-SIDA que tienen conocimientos positivos tienen 5,613 veces más probabilidades de tomar precauciones contra el COVID-19 que las personas con VIH-SIDA que tienen conocimientos negativos.

La conclusión es que los trabajadores de la salud pueden participar y colaborar en aumentar el conocimiento en la aplicación de los protocolos sanitarios para que las personas con VIH-SIDA estén protegidas del COVID-19.

Palabras clave: COVID-19, VIH-SIDA, medidas preventivas.

INTRODUCTION

Coronavirus Disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first reported in Wuhan, China, in December 2019 and has spread widely in the world (1). According to live report data from Wordometers, as of April 19, 2022, the total number of confirmed cases worldwide has reached 503 131 834 people, with 6 200 571 deaths, in which the United States has the highest incidence rate globally, with 79 896 146 cases (2).

More than two years have passed since the COVID-19 pandemic began in Indonesia. The government has made efforts to reduce the transmission rate, including the implementation of extensive social restrictions in several regions. However, the government indicated that COVID-19 will continue to spread in the community. On April 20, 2022, the number of COVID-19 cases increased dramatically, and the number of new cases in Indonesia reached 45 091 cases (0.74 %), 155 974 deaths, and 6 042 010 confirmed cases (2).

As of April 20, 2022, the cumulative development of COVID-19 cases in South Sulawesi Province reached 143 394 confirmed cases (2.37 %), with 2 471 deaths and 140 850 recoveries. Meanwhile, cumulative case developments in Makassar City as of April 21, 2022, were reported as 64 094 confirmed cases (1.06 %), 1 103 deaths, and 62 991 recoveries (2).

The COVID-19 pandemic has resulted in extremely serious problems that affect numerous industries. In addition to being a global issue, the state of the COVID-19 pandemic has had a significant impact on the lives of people with human immunodeficiency virus (HIV)-associated autoimmunity, and it appears that people with HIV-AIDS (acquired immunodeficiency syndrome) are battling multiple viral pandemics, including COVID-19 infection. The conflict begins with access to food, nutrition, medical care, and social life. All HIV/AIDS-related resources and infrastructure have been redirected to COVID-19 preventive efforts (3). During the COVID-19 pandemic, the government had to deal with HIV-AIDS cases with extra caution.

The concern over the increased risk for severe COVID-19 disease for PLHIV may assume that PLHIV is more likely to be immunosuppressed. HIV infection is associated with abnormal humoral and T-cell-mediated immune responses, resulting in increased susceptibility to numerous opportunistic infections. Under this rationale, particular caution is warranted for PLHIV with low CD4 cell count, advanced disease, high viral load, and those not taking antiretroviral treatment (ART). Consequently, it is essential to properly monitor and educate people living with HIV (PLWHA) during treatment, particularly during the COVID-19 pandemic (2).

In 2020, according to the World Health Organization (WHO), there will be 38 million people infected with HIV-AIDS, 1.7 million new infections, and 700,000 HIV-AIDS-related deaths worldwide. With a total of 25.7 million cases, Africa has the highest number of HIV/AIDS cases compared to other continents. Southeast Asia is ranked third with 3,7 million HIV/AIDS cases. Of the 38 million people who will be infected with HIV-AIDS in 2020, 36,2 million will be elderly and 1.8 million will be children aged 15 and younger.

According to the death rate, there will be 690,000 HIV-AIDS-related deaths worldwide in 2020. According to data (4), 50 percent of those infected are 15- to 24-year-olds who are exposed daily, and 30 to 40 million people between the ages of 15 and 24 live with HIV-AIDS worldwide.

Before the outbreak of the COVID-19 pandemic, the number of HIV-AIDS transmissions in Indonesia fluctuated and increased annually. The number of people infected with HIV in Indonesia has increased dramatically over the past eleven years. 50 282 people are living with HIV, of whom 7 036 (13.9 %) develop AIDS. From 46 659 AIDS cases in 2018, the number of individuals living with HIV/AIDS increased to 10 190 (21.8 %). East Java had the highest number of HIV-AIDS cases with 8 935 cases (17.76 %), followed by DKI Jakarta with 6 701 cases (13.32 %), West Java with 6 066 cases (12.06 %), Central Java with 5 630 cases (11.19 %), and Papua with 3 753 cases (7.46 %) (4).

With 14 115 cumulative HIV-AIDS cases in March 2020 (27.88 %), South Sulawesi ranks

among the top 10 provinces and the number continues to rise (South Sulawesi Health Office, 2022). On the other hand, the number of HIV-AIDS cases in Makassar City from 2018 to 2020 was estimated to be 3 246 (24.27 %). According to data from 2020, out of 908 people, 704 were infected with HIV (77.53 %) and 204 were infected with AIDS (22.46 %) (2).

People with HIV-AIDS (PLWHA) with a high rate of transmission must be taken seriously by developing special policies to combat the COVID-19 pandemic. According to data published by the Centers for Disease Control and Prevention, people infected with HIV (PLWHA) have a greater risk of contracting COVID-19, particularly those with low CD4 cell counts (200 cells/mL), compared to non-HIV-infected patients (5). Findings from (6) in the UK, indicate that those infected with HIV have a 63 % to 130 % greater risk of dying from COVID-19 than those who are not. There is a possibility that HIV-positive individuals will carry other diseases, such as tuberculosis, diabetes, heart disease, and hypertension, which commonly affect HIV-positive individuals (PLWHA) (7).

According to the World Health Organization (WHO), the risk of COVID-19 infection in a person infected with HIV is higher; thus, people living with HIV-AIDS (PLWHA) who have not received confirmation of the virus with antiretrovirals (ARVs) are susceptible to opportunistic infections that spread in the environment (2). Because their immune system has not recovered, they are also susceptible to contracting other diseases. The results of observations (8) revealed that people with HIV-AIDS believed they were at a high risk of contracting COVID-19 (81.3 percent) and at a high risk of dying from COVID-19 (21.3 percent); thus, a person infected with HIV-AIDS should take maximum precautions to prevent the spread of COVID-19.

It is recommended that a person infected with HIV-AIDS take the same precautions as the general population following the rules and notice from the World Health Organization (WHO) and the Indonesian Ministry of Health to wash hands frequently, apply to sneeze and coughing etiquette, maintain physical and social distance, wear a mask, seek medical attention if

experiencing symptoms, and isolate oneself if experiencing symptoms or coming into contact with a positive COVID-19 test (10). Knowledge is crucial in determining the readiness of people's attitudes, particularly those of people with HIV-AIDS (PLWHA), to receive behavioral change measures from health authorities. In addition, assessing the community's knowledge of COVID-19 is essential to better understand and address knowledge gaps in disease prevention (13).

A person living with HIV/AIDS (PLWHA) requires social support from his community to manage stress and maintain resilience. Social support is an external factor that influences resilience. The family, according to Lemme is distinct from other social interaction systems. It is separated from its independent prevention model in this context. Thus, social support from the family plays a crucial role in the formation of an individual's life. Families can provide social support by providing love, care, and support in the form of family goods and services that can motivate an HIV-positive individual (PLWHA) (13).

The COVID-19 vaccination is an effective method for preventing the spread of the COVID-19 virus. It is recommended that people living with HIV-AIDS (PLWHA) receive the COVID-19 vaccine to prevent serious illness from SARS-CoV-2 and potentially reduce the risk of exposure to SARS-CoV-2. PLWHA should continue to receive ART regularly (WHO, 2022).

Globally, 378 cases of COVID-19 in HIV have been reported to date, with 101 cases in England and 122 cases in the United States, according to available research data (14). In the meantime, Indonesia recorded 77 positive cases of COVID-19 between March and August of 2020, including 8 deaths among HIV-positive individuals. As of March 27, 2022, there have been 2 confirmed cases and deaths of PLWHA with COVID-19 in Makassar City (15).

According to the HIV-AIDS surveillance book and the pre-antiretroviral register at the Jumpandang Baru Public Health Center in Makassar City, there were very few HIV-positive individuals with confirmed COVID-19 case. One HIV-AIDS patient has been confirmed to have

COVID-19. The low number of COVID-19 cases reported is attributable to the limited COVID-19 testing conducted by healthcare professionals among HIV-positive individuals (PLWHA). However, despite the lack of data on HIV-AIDS patients with confirmed COVID-19 infection, it deserves serious consideration because HIV-AIDS patients have a history of opportunistic tuberculosis infection. There are 50 cases, and 151 individuals have discontinued ARV drug use.

COVID-19 is currently experiencing viral mutations that cause it to spread more rapidly, and the population of people with HIV-AIDS (PLWHA) is susceptible to COVID-19 disease, so there is a need for heightened concern on the risk of transmission to determine what factors are associated with COVID-19 prevention measures in people living with HIV-AIDS (PLWHA).

METHOD

This researcher applied an analytic cross-sectional observational study approach. The research was conducted at the Jumpandang Baru Public Health Center on Jl. Ir. H. Juanda No. 1 in Makassar. This study was conducted between July 1 and August 31, 2022. In 2022, the Jumpandang Baru Public Health Center in Makassar, Indonesia, had a population of 659 HIV-positive individuals undergoing ARV therapy. This study's sample consisted of individuals with HIV/AIDS in the service area of the Jumpandang Baru Public Health Center in Makassar City who were willing to take part in the study.

The research population was sampled using a simple random technique. Questionnaires were distributed to respondents for the collection of primary data. In the meantime, secondary data were collected from medical record books at the Jumpandang Baru Public Health Center, and a literature review was conducted.

The instrument in this research was a structured questionnaire that had been tested first by testing the validity and reliability. Statistical Product and Service Solutions (SPSS) was used for data processing. Before data analysis, data were edited, coded, entered, processed, and cleaned.

ANALYSIS OF PREVENTION OF COVID-19 TRANSMISSION MEASURES

This study's data analysis was conducted using statistical analysis, including univariate, bivariate, multivariate, candidate selection, and multivariate analysis. The data was presented in tabular format, including a frequency table (one-way tabulation) and a cross-tabulation (two-way tabulation).

RESULT

The distribution of respondents' characteristics can be seen in Table 1.

Table 1

Distribution of Respondents Based on Gender, Age, Occupation, and Education at the Puskesmas Jumpandang Baru Makassar City

Respondent Characteristics	Numbers of Respondents (n= 188)	
	n	%
Gender		
Male	146	77.7
Female	42	22.3
Age (years)		
20-29	98	52.1
30-39	65	34.6
40-45	16	8.5
46-54	9	4.8
Occupation		
Unemployed	72	38.3
Private Employee	57	30.3
Civil Servant	20	10.6
Entrepreneur	39	20.7
Education		
Junior High School	9	4.8
Senior High School	136	72.3
Bachelor's degree	43	22.9

Source: Primary Data, 2022

Table 1 shows that most respondents are male, 146 individuals (77.7 %). Most respondents, 98 (52.1 %) fall between the ages of 20 and 29. In addition, it reveals that more respondents are unemployed, a total of 72 individuals (38.3 %).

Seventy-two percent of respondents were high school graduates or a total of 136 individuals.

Table 2 indicates that, out of 188 respondents, 111 (59.0 %) have a good level of knowledge, while 77 (41 %) have inadequate knowledge. For the variable of family social support, 147 respondents (78.2 %) have poor family social support, compared to 41 respondents (21.8 %) with good family social support.

Table 2

Distribution of Respondents Based on Research Variables at Jumpandang Baru Public Health Center Makassar City

Research Variable	Numbers of Respondents (n=188)	
	N	%
Knowledge		
Poor	77	41.0
Good	111	59.0
Family Social Support		
Poor	147	78.2
Good	41	21.8
Attitude		
Poor	74	39.4
Good	114	60.6
Vaccination		
No	55	29.3
Yes	133	70.7
ARV Treatment		
Compliance	75	39.9
Non-Compliance	113	60.1
COVID-19 Preventive measure on People Living with HIV-AIDS		
Poor	32	17.0
Good	156	83.0

Source: Primary Data, 2022.

The attitude variables contain more respondents with positive attitudes, 114 respondents (60.6 %), than respondents with negative attitudes, 74 respondents (39.4 %). Then, the vaccination variable has more respondents who have been vaccinated for COVID-19 than those who have not been vaccinated for COVID-19, with 133 respondents (70.7 %) instead of 55 respondents (29.3 %).

The ARV treatment variable has a greater proportion of patients in the compliant category, 113 respondents (60.1 %), than in the non-compliant category, 75 respondents (39.9 %). Lastly, the dependent variable, which is the level of COVID-19 prevention measures, has a greater proportion of respondents in the good category, 156 respondents (83 %) as opposed to 32 respondents (17 %) in the poor category.

A bivariate analysis was performed to determine the relationship between the independent variables (knowledge, social support from family, attitudes, vaccination, and ARV treatment) and the dependent variable (ARV treatment) (COVID-19 prevention measures on people with HIV-AIDS). Cross-tabulation analysis was used to conduct bivariate analysis (Table 3).

Table 3
The Relationship of Research Variables with COVID-19 Prevention Measures in PLWHA
at the Jumpang Baru Public Health Center Makassar City

Independent Variable	Poor		Good		N	Total %	p-value
	n	%	n	%			
COVID-19 Preventive Measure on People Living with HIV-AIDS							
Knowledge							
Poor	5	6.5	72	75.7	77	100	0.001
Good	27	24.3	84	93.5	111	100	
Family social support							
Poor	28	19.0	119	81.0	147	100	0.162
Good	4	9.8	37	90.2	41	100	
Attitude							
Poor	5	6.8	69	76.3	74	100	0.003
Good	27	23.7	87	93.2	114	100	
Vaccination							
No	4	7.3	51	78.9	55	100	0.022
Yed	28	21.1	105	92.7	133	100	
ARV Treatment							
Compliance	18	24.0	57	76.0	75	100	0.038
Non-compliance	14	12.4	99	87.6	113	100	
Total	32	17.0	156	83.0	188	100	

Source: Primary Data, 2022

The knowledge variable reveals that 5 respondents (6.5 %) with HIV-AIDS have poor knowledge and poor COVID-19 prevention measures, whereas 72 respondents (75 %) have poor knowledge and good COVID-19 prevention measures. Then, 27 respondents (24.3 % of the sample) had good knowledge of COVID-19 prevention measures, and 84 respondents (93.5 % of the sample) had both good knowledge and good COVID-19 precautions.

Based on the results of the Chi-square test, it is evident that the p-value ($p = 0.001$) is less than or equal to 0.05, indicating that H_0 is rejected. This means that there is a relationship between knowledge and preventive measures for COVID-19 in people with HIV-AIDS.

The family social support variable reveals that 28 HIV-positive respondents (19 %) had poor family social support and poor COVID-19 prevention measures, while 119 respondents

(81.0 %) had poor family social support and good COVID-19 prevention measures. The number of respondents with good family social support and poor COVID-19 prevention measures was 4 (9.8 %), and the number of respondents with good family social support and good COVID-19 prevention measures were 37 (90.2 %).

According to the results of the Chi-square test, the value ($p = 0.162$) is greater than 0.05, indicating that H_0 is accepted. This indicates that there is no association between family social support and COVID-19 prevention measures in HIV/AIDS patients.

In the vaccination variable, there are 4 respondents (7.3 %) with HIV-AIDS who are not vaccinated with poor COVID-19 prevention measures, and 51 respondents (92.7 %) who are not vaccinated with good COVID-19 prevention measures. The number of respondents who were vaccinated with inadequate COVID-19 precautions was 28 (21.1 %), while the number of respondents who were vaccinated with good COVID-19 precautions was 105 (78.9 %).

Based on the results of the Chi-square test, the p-value ($p = 0.022$) is less than 0.05, meaning that the null hypothesis (H_0) is rejected. This indicates a correlation between vaccination and COVID-19 prevention measures in HIV-AIDS patients.

The ARV treatment variable reveals that 18 respondents (24 %) do not comply with ARV treatment with poor COVID-19 prevention measures, whereas 57 respondents (76 %) do not comply with ARV treatment with good COVID-19 prevention measures. The number of respondents who comply with ARV treatment with inadequate COVID-19 prevention measures was 14 (12.4 %), while the number of respondents who comply with ARV treatment with good COVID-19 prevention measures was 99 (87.6 %).

Based on the results of the Chi-square test, the p-value ($p = 0.038$) is less than 0.05, meaning that the null hypothesis (H_0) is rejected. This indicates a relation between ARV treatment and COVID-19 prevention measures in HIV-AIDS patients.

The purpose of multivariate analysis is to determine the most important variable among the dependent variable and several independent

variables. In this multivariate analysis, the logistic regression test is utilized. There are multiple steps involved in logistic regression analysis, including:

Candidate Selection

At this stage, all independent variables related to COVID-19 prevention measures in people living with HIV/AIDS (PLWHA) will be selected to determine which variables are eligible for inclusion in the multivariate test model. The independent variables tested were knowledge, family social support, attitudes, vaccination, and ARV treatment.

In logistic regression, the eligible variables are those with a significance level (sig.) or p-value of 0.025 when using the "Enter" method, or in other words, performing a logistic regression between each independent variable and the dependent variable individually (Table 4).

Table 4

Results of Analysis of Logistic Regression Selection with COVID-19 Prevention Measures for PLWHA at Jumpandang Baru Public Health Center Makassar City

Variable	p-value
Knowledge	0.001
Attitude	0.003
Family Social Support	0.162
Vaccination	0.022
ARV Treatment	0.038

Source: Primary Data, 2022.

The results of the multivariate selection analysis using the logistic regression test indicate that family social support ($p = 0.162$) was ineligible to be included in the multivariate test. Its p-value was greater than 0.25, whereas knowledge ($p = 0.001$), attitude ($p = 0.003$), vaccination ($p = 0.022$), and ARV treatment ($p = 0.038$) were eligible to be included because their p-values were less than 0.25.

A multivariate analysis was conducted after the selection of several independent variables and the acquisition of the variables that were eligible for inclusion. The outcomes of the multivariate analysis are presented in the table below.

Multivariate Analysis Stage

A multivariate analysis was conducted after the selection of several independent variables and the acquisition of the variables that were eligible for inclusion (Table 5).

Table 5

Results of Analysis of Logistic Regression Selection with COVID-19 Prevention Measures for PLWHA at Jumpandang Baru Public Health Center Makassar City

Variable	B	S.E.	Wald	df	Sig.	Exp (B)	95 % C.I.for EXP(B)	
							Lower	Upper
Knowledge	1.725	0.527	10.704	1	0.001	5.613	1.997	15.775
Vaccination	1.363	0.578	5.555	1	0.018	3.907	1.258	12.132
ARV Treatment	-846	0.417	4.120	1	0.042	0.429	0.189	0.971
Constant	1.174	0.324	13.123	1	0.0001	3.235		

Source: Primary Data, 2022

According to Table 5, the results of the multivariate analysis using the logistic regression test revealed three variables related to COVID-19 prevention measures in people with HIV/AIDS (PLWHA) that were statistically significant with a p-value less than 0.05. These are awareness ($p=0.001$), vaccination ($p=0.018$), and ARV therapy ($p=0.042$). The dominant factor that is related to COVID-19 prevention measures in people with HIV-AIDS (PLWHA) the most is the knowledge variable with a value (OR: 5,613, 95 % CI: 1,997, 15,775). People with HIV-AIDS with greater knowledge were 5.61 times more likely to take COVID-19 prevention measures than those with HIV-AIDS with less knowledge.

DISCUSSION

This study aims to examine the relationship between the studied variables and the analysis of COVID-19 prevention measures in HIV-positive individuals at the Jumpandang Baru Public Health Center in Makassar. The research demonstrates a correlation between HIV-AIDS patients' knowledge, attitudes, vaccination, ARV treatment, and COVID-19 prevention measures (PLWHA). In contrast, family social support did not demonstrate a significant correlation. The

results of each variable will be discussed below, based on the findings of previous data analysis.

Knowledge in relation to the prevention of the spread of COVID-19 plays an important role in increasing public awareness of the importance of information to reduce morbidity and mortality due to COVID-19 transmission (16).

Knowledge was found to have a significant relationship with COVID-19 prevention measures among people living with HIV/AIDS (PLWHA) ($p = 0.001$). 84 respondents (75.7 %) have a solid understanding of effective COVID-19 prevention measures. Several factors, such as type of work, education, age, experience, culture, and information, influence a person's understanding of particular subjects (17).

Knowledge acquired by a person is mostly from the educational process, both formal and non-formal education. Experience, both one's own and the experiences of others, can be a source of knowledge in addition to the educational process. In addition, knowledge can be gathered from the mass media and the outcomes of environmental interactions (18).

Most respondents possess excellent levels of knowledge. This condition is supported and influenced by the respondents' levels of education, with the majority of respondents holding a high

school diploma (136 respondents, 22.9 %) and a bachelor's degree (43 respondents, 72.3 %). Education has the greatest impact on knowledge. The findings of this study indicate that respondents have an excellent understanding of COVID-19. This is consistent with research indicating a connection between education and COVID-19 prevention behavior in the community. The higher a person's education level, the better at preventing COVID-19. According to the respondent's knowledge of COVID-19, people with HIV-AIDS always follow health protocols, such as washing hands, using hand sanitizer, wearing masks when leaving the house, exercising, practicing physical distancing and self-isolation when sick, and consuming nutritious food.

Although most respondents have good knowledge, there are still poor COVID-19 prevention measures for HIV-AIDS patients with poor knowledge (24.3 %). The number of HIV-positive individuals who lack this knowledge is not insignificant. Additionally, COVID-19 is a virus that can cause respiratory infections and even death. Therefore, increasing the knowledge of people living with HIV-AIDS should be a serious concern for health workers.

This is in line with the findings of research on the Chinese population where it was determined that there is a correlation between knowledge and attitudes regarding COVID-19 prevention (OR: 0.75-CI OR 0.90, $p < 0.001$). Thus, better knowledge becomes a protective factor in COVID-19-preventive behavior. In effect, it can be concluded that HIV-positive individuals need the knowledge to guide their efforts to prevent COVID-19 infection. This means that the more HIV-positive individuals know about COVID-19, the more likely they are to take precautions against the virus. Conversely, the less HIV-AIDS patients know about COVID-19, the less likely they are to take preventative measures against COVID-19. It demonstrates that knowledge is one of the variables associated with COVID-19 prevention measures in HIV/AIDS patients.

The primary supporter of people living with HIV-AIDS (PLWHA) is family social support, which plays a central role as a companion in daily life, dealing with both disease prevention and treatment supervision. The family is the basis of treatment for every patient with a chronic disease such as HIV-AIDS. Complex problems ranging

from physical, mental, and social conditions (stigma and discrimination) are likely to affect the treatment process and quality of life of people living with HIV/AIDS (19).

The relationship between the levels of family social support and COVID-19 prevention measures in people with HIV-AIDS (PLWHA) was found not significant. The percentage of HIV-positive individuals who have poor family social support and poor COVID-19 prevention measures. People with HIV-AIDS reported that they did not receive adequate social support from their families because their disease status was unknown to them, let alone special attention in implementing health protocols, and providing hand sanitizer masks, and nutritious food.

This is consistent with the findings of the study (20), which revealed that the majority of people living with HIV/AIDS (PLWHA) did not feel supported by their families. This may occur because many of them continue to keep their HIV status a secret and because they do not live with family members and have been independent during health monitoring and treatment. On the contrary, another research study (21) found that the relationship between family social support and COVID-19 prevention behavior was statistically significant, indicating that the majority of respondents acknowledged that their families provided them with strong support. The assistance received includes both informational and emotional support. The family reminded respondents to wash their hands and, if leaving the house, to wear a mask, maintain a physical distance, and bring hand sanitizer.

Thus, it is clear that the less family social support given to people living with HIV-AIDS, the less attention they will pay to taking preventive measures against COVID-19; conversely, the more family social support, the more attention people living with HIV-AIDS will pay to prevent COVID-19. It indicates that social support from family is one of the factors associated with COVID-19 prevention measures in HIV-positive individuals.

Attitude is a predisposing factor in disease prevention efforts, attitude is a factor that influences a person in preventing the outbreak of disease because disease prevention efforts correlate with people's attitudes. A person's

attitude is also influenced by their level of knowledge; a solid understanding of COVID-19 prevention is the foundation of a person's attitude toward the disease's prevention.

Our data indicate that attitude has a significant relationship with COVID-19 prevention measures among people with HIV/AIDS, where 93.2 % of respondents have a positive attitude toward good COVID-19 prevention measures. As many as 84 respondents (93.5 %) with HIV/AIDS have a good attitude toward taking preventative measures against COVID-19 and have a relationship with good knowledge. Based on the data of the respondent's responses, it is stated that the respondents had undergone a medical examination by the healthcare service when experiencing fever, dizziness, and dry cough for an extended period, as well as implementing health protocols, such as wearing a mask when leaving the house, maintaining distance, and maintaining personal hygiene (personal hygiene) to prevent COVID-19 transmission.

This is consistent with the research finding (22) indicating that there is a relationship between attitude and COVID-19 prevention practices, with 70.9 % of respondents with a score (OR: 4.300, 95 % CI: 2.351, 7.868), indicating that students with a positive attitude have a 4.300 times impact on COVID-19 prevention practices. Receiving information from television (74.9 %), being an active user of social media (65 %) and having a high level of knowledge (81.8 %) all influence the respondents' attitude toward implementing COVID-19 prevention practices.

According to the findings of the same study conducted by (23), attitudes and COVID-19 prevention measures are related. Most Murtajih Village residents are in favor of preventing the spread of COVID-19, as 53 individuals (58.5 %) hold positive views. A respondent's attitudes are influenced by his or her knowledge of COVID-19, such that the respondent can determine and make decisions regarding COVID-19 prevention.

While the results of a different study conducted by (24) indicated that of 1,096 respondents, 50.8 % had negative public attitudes toward the occurrence of the COVID-19 pandemic. This is because individuals with poor knowledge are 4,992 times more likely to have a negative attitude than those with good knowledge.

A person's behavior will be influenced by his or her level of knowledge about preventing COVID-19. The more positive the attitude of people with HIV/AIDS, the more effective their efforts to prevent COVID-19 will be. On the contrary, the fewer efforts made to prevent COVID-19 are proportional to the attitude of HIV-positive individuals. This indicates that attitude is one of the variables associated with COVID-19 prevention measures in people with HIV/AIDS.

The COVID-19 vaccination is an integral part of a comprehensive and integrated response to the COVID-19 pandemic, which includes the implementation of health protocols such as practicing physical distance, washing hands with soap, wearing masks, the COVID-19 vaccination, and 3T (Test, Tracing, Treatment) (25). Vaccination can reduce COVID-19 transmission as well as COVID-19-related morbidity and mortality. It can also help in achieving herd immunity and protecting the community from COVID-19 so that the community can continue to be socially and economically productive.

The level of vaccination was found to have a significant correlation with COVID-19 prevention measures among individuals living with HIV/AIDS. In effect, 92.7 % of respondents were vaccinated against COVID-19 with effective COVID-19 prevention. With this percentage, people living with HIV/AIDS (PLWHA) who were vaccinated realized that, as a population susceptible to diseases such as COVID-19, getting vaccinated helps maintain immune resistance and protects against COVID-19 exposure. In addition, the presence of this vaccine can mitigate more severe impacts or side effects in HIV/AIDS patients who test positive for COVID-19. This action is identical to the WHO recommendation (2020), which states that people with HIV/AIDS should be a population of particular concern for COVID-19 vaccination based on the epidemiological setting.

This is consistent with the findings of the study (26) indicating that HIV-positive individuals who received the COVID-19 vaccine exhibited positive outcomes and received the same benefits as other individuals. Using a standard vaccination regimen protected exposure to COVID-19 among people living

with HIV-AIDS (PLWHA) with CD4+ > 350 cells/L, according to the same study conducted by (27). WHO (2020) currently recommends the use of COVID-19 vaccines (AstraZeneca/Oxford, Johnson and Johnson, Moderna, Pfizer/BioNTech, Sinopharm, and Sinovac) to protect HIV-positive individuals from COVID-19. The COVID-19 vaccination is associated with the prevention of COVID-19 in HIV-positive individuals. This indicates that the greater the number of people with HIV-AIDS (PLWHA) who are vaccinated against COVID-19, the greater the protection against severe impact or effects when diagnosed with COVID-19.

According to a study HIV-positive individuals who take tenofovir disoproxil fumarate (TDF) can prevent SARS-CoV-2 infection. To prevent COVID-19, it is necessary to take the same precautions as the general public (28).

The level of ARV treatment was found to have a significant relationship with COVID-19 prevention measures among people living with HIV/AIDS (PLWHA), since 87.6 %, or 99 respondents, adhere to ARV treatment with effective COVID-19 prevention measures. People with HIV-AIDS (PLWHA) believe that inconsistently taking ARV medications at the same time/hour every day will reduce the number of CD4+ cells in the immune system, thereby increasing the risk of COVID-19 infection.

It is shown that if people with HIV (PLHIV) are disciplined and consistent in taking ARVs, their immune systems will improve. In addition to boosting the body's immune system, HIV-positive individuals believe that taking ARVs regularly will maintain the body's stability, increase endurance, and make the body healthier. Although people with HIV can be at risk for infection with COVID-19, people with HIV (PLWHIV) report that there will be a difference in impact between those who take ARVs regularly and those who do not/have not taken ARVs.

On this basis, it can be concluded that the more regularly ARV drugs are taken, the greater the immune system's ability to improve and reduce COVID-19 transmission. On the other hand, the greater the number of people who do not take ARV medications regularly, the greater the risk of COVID-19 transmission among HIV-positive individuals whose immune systems are

compromised. This indicates that adherence to ARV treatment is one of the factors associated with COVID-19 prevention measures in HIV/AIDS patients.

Based on the results of the multivariate analysis conducted using logistic regression, it can be concluded that the dominant factor that is most related to COVID-19 prevention measures in people with HIV-AIDS is the knowledge variable with a value (OR: 5.613, 95 % CI: 1.997, 15.775) $p < 0.001$.

During the research process conducted at the Jumpandang Baru Public Health Center in Makassar City, it was discovered that most people with HIV-AIDS (93.5 % of 84 respondents) have adequate knowledge of COVID-19 prevention measures. This is also influenced by the respondent's education level, which is dominated by secondary and higher education, so they frequently obtain information from local governments and health professionals. This is in line with the findings of the study (29) "COVID-19-related knowledge, attitudes, and practices in Indian Population: An online national cross-sectional survey" where is indicated that knowledge is the strongest predictor of COVID-19 prevention practices, with an OR= (95 % CI 1.181(1.117-1.25) $p < 0.0001$.

Multiple logistic regression analysis of the study "Knowledge, Attitudes, and COVID-19 Prevention Practices of Healthcare Workers in Indonesia: A Mobile-based Cross-sectional Survey" (30) revealed that health workers with very good knowledge about COVID-19 were twice as likely to practice good COVID-19 preventive behavior as health workers with less knowledge (OR=0.03, $p=0.090$).

CONCLUSION

Based on the results of research conducted at the Jumpandang Baru Public Health Center Makassar City regarding the analysis of COVID-19 prevention measures in people with HIV-AIDS (PLWHA), it can be concluded that:

1. There is a significant relationship between knowledge and preventive measures for COVID-19 in people living with HIV-AIDS

- (PLWHA) with a p-value of 0.001 ($p < 0.05$).
2. There is no significant relationship between family social support and COVID-19 prevention measures in people with HIV-AIDS (PLWHA) with a p-value of 0.162 ($p > 0.05$).
 3. There is a significant relationship between attitudes and COVID-19 prevention measures in people with HIV-AIDS (PLWHA) with a p-value of 0.003 ($p < 0.05$).
 4. There is a significant relationship between vaccination and COVID-19 prevention measures in people with HIV-AIDS (PLWHA) with a p-value of 0.022 ($p < 0.05$).
 5. There is a significant relationship between ARV treatment and COVID-19 prevention measures in people with HIV-AIDS (PLWHA) with a p-value of 0.038 ($p < 0.05$).
 6. The variable that is most related to COVID-19 prevention measures in people with HIV-AIDS (PLWHA) is knowledge with an Exp (B) value of 5.613. People with HIV-AIDS who have positive knowledge have a relationship of 5.613 times to take preventive measures against COVID-19 compared to people with HIV-AIDS who have negative knowledge.

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ANALYSIS OF PREVENTION OF COVID-19 TRANSMISSION MEASURES

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