ORIGINAL ARTICLE

The Effect of COVID-19 Vaccination and Application of Health Belief Model on Health Protocol Compliance Among Elderly in Urban Area

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ABSTRACT

Introduction: The COVID-19 pandemic in Indonesia has been deemed under control since 2022, however ongoing prevention efforts are still necessary, especially for the elderly. Although Greater Jakarta has attained more than 70% vaccine coverage, it is uncertain how well the elderly complies with the health protocols in this region. Hence this study aims to determine the correlation between vaccination and the application of the Health Belief Model towards health protocol compliance among the elderly. **Methods:** This study used a cross-sectional approach recruiting 601 senior citizens who were chosen from selected district in Greater Jakarta using multistage cluster sampling. **Results:** Less than half of the elderly (44.8%) demonstrated good compliance towards health protocol, with the mean compliance score of 37.3 (SD 7.1). Majority of the elderly had received the second dose of their vaccinations (39.4%) but 14.8% of the elderly still not vaccinated. Path analysis yielded both direct significant correlation between vaccination and compliance of health protocol (r=0.108; 95% CI 0.253 – 1.227) and there is also indirect correlation between Health Belief Model variables through perceived of barrier (r=0.040), health motivation (r=0.019) and cues for action (r=0.012). **Conclusion:** In conclusion, the vaccination and Health Belief Model is proven effective in predicting the elderly compliance towards health protocol. This study recommends government to improve the coverage of booster vaccination in order to maintain the compliance of COVID-19 health protocol among the elderly.

Keywords: COVID-19 Vaccination; Elderly; Health Protocols; Health Belief Model

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INTRODUCTION

The national report of COVID-19 incidence in Indonesia shows that within the last year of 2022, the number of COVID-19 transmission has fully controlled, even though the peak of cases remains appearing. Since July 2022, there were small peak of cases in August 2022 and November 2022 with 6.53 and 8.49 daily reported cases respectively (1). The trend was quite similar with the global and regional trend as reported by World Health Organisation (WHO) (2).

The assessment of COVID-19 pandemic situation (3), as of December 2022, indicated that Indonesia was in level 2 category which implied that medium number of COVID-19 incidence cases were locally transmitted during the last 14 days period, with COVID-19 transmission is not focused at specific population, and medium risk of infection among general population. Indonesia has been reported to be at level 1 community transmission, based on the confirmation rate of 2.66 per 100,000 (target <20 confirmation cases per 100,000 population), hospitalisation rate of 0.50 per 100,000 population (target <5 per 100,000 population) and death rate was 0.05 per 100,000 population (target <1 per 100,000 population). Meanwhile, Indonesia's response capacity was in limited level category because the positivity rate was about 3.5% per week (target <5% per week), ratio of close contact and confirmation cases was 12.3 (target >14) and bed occupation rate was 5.9% (target <60%). For vaccination coverage, Indonesia has achieved the "adequate" level which is shown by number of coverages of complete vaccination among general population and elderly were 74.1% and 70.5%, respectively, and both are above the national target.

Cases relaxation as mentioned above does not imply that COVID-19 will not be the health issue again in Indonesia. The risk of increased number of cases is high since the virus characteristic for mutation is still

possible (4) and according to Agaku et al. (5) there were downwards trend of the COVID-19 prevention behaviour adherence. Therefore, the prevention effort in anticipating the increased number of cases need to be performed, particularly among the elderly, the highest risk population of the COVID-19 transmission (6). The number of confirmed cases among elderly was about 11.0% of total reported cases and almost half of the COVID-19 related death was reported among elderly (47.6%) (1). This condition is also reported in DKI Jakarta (Special Capital Region of Jakarta), as the capital of Indonesia, and West Java, as neighbour province of DKI Jakarta, that cumulatively contributed around 40.4% of national COVID-19 cases. Moreover, among this group, the coverage of complete vaccination is lower than the coverage among general population (74.3% vs. >100%) (7).

Not only vaccination, other primary prevention efforts carried out among this group of elderly people are also reported to be quite low. A previous study reported that the compliance of the elderly in rural areas in implementing health protocols was 71.6% (8). The proportion of elderly adherence in urban areas showed almost the same results (72.6%) (9). Another study conducted in Vietnam (10) had shown that deterrence behaviour is influenced by perceived threats (severity and vulnerability). Furthermore, in the elderly group, risk perception is strongly influenced by information characteristics including relevant information, informative support and source credibility. Meanwhile a study conducted in Thailand showed that income, family support and access to health facilities were factors that influenced the implementation of health protocols in the elderly (9).

A previous a study stated that prevention (including vaccination) can increase feelings of strength which leads to increased social behaviour at least in short periods (11). Referring to the theory of the Health Belief Model (HBM), people will take action to prevent disease if they consider themselves susceptible to a condition (perceived susceptibility), if they believe it will have potentially serious consequences (perceived severity), if they believe that certain actions are available for them it will reduce vulnerability or severity or lead to other positive outcomes (perceived benefit), and if they perceive some negative attribute associated with the health measure (perceived inhibition) (12).

Considering that the distribution of COVID-19 events occurs in Greater Jakarta area and until now there is no known description of the level of compliance of the elderly towards the implementation of health protocols, especially when there is a decline in cases. Therefore, it is necessary to conduct a study to identify the elderly compliance and test the hypothesis whether vaccination affects the implementation of the health protocol through changes in perceived barriers, perceived benefits, health motivation, perceived vulnerability, perceived seriousness, and cues to act.

MATERIALS AND METHODS

The cross-sectional study design is utilised in this study. Urban area in DKI Jakarta and its surrounding district was purposively selected as study location, namely East Jakarta, North Jakarta in DKI Jakarta Province, and Depok City, Bekasi City and Greater Bogor in West Java Province. The selection criteria for the area were due to the high proportion of elderly in each district. The number of elderly populations within this area are around 1,556,996 population. The elderly who met the selection criteria were then selected as respondents. The inclusion criteria of respondents were aged >60 years old, local dwellers, having good communication skill, being healthy (physically and mentally), and willing to participate in this study. All elderly individuals who met these criteria were subsequently undergo in-person interviews conducted by the enumerators at the designated location. Exclusion criteria are not required as the data collection endeavours to achieve a comprehensive representation of the community and augment the significance of the findings for public health interventions.

The study used alpha 0.05 with two sides and the Z level 1.96, while the power of study is determined at 90% with beta score 1.28. The correlation score was gained from the previous research of the correlation of vaccination and the compliance of the face mask and social distancing in the United States of America (USA) which was 0.374 (13). Utilising an online sample size calculator available at https://sample-size.net/correlation-sample-size/and considering the aforementioned information, the calculated minimum sample size was determined to be 54. Conversely, employing a lower correlation coefficient based on a similar formula (14), with r values of 0.1 and 0.2, would result in maximum sample sizes of 783 and 194, respectively.

The sampling procedure used multistage cluster sampling. Cluster is defined as neighbourhood, and its purposively selected from each district. There were 6943 clusters identified and 41 of them were selected. Of the selected clusters, the sampling frame that consist of list of elderly (>60 years) within the neighbourhood was developed and around 14-15 respondents were approached and interviewed from each cluster.

There were 8 variables observed and that used several validated and reliable instruments. The researcher developed the instrument and conducted a preliminary test on approximately 49 elderly

individuals (which were excluded from the actual study) to assess the validity and reliability before proceeding with data collection.

The main outcome was COVID-19 protocol compliance that consisted of 10 questions (Cronbach Alpha 0.707; corrected item-total correlation 0.653-0.787) with the option "1: Never", "2: Rarely", "3: Occasionally", "4: Frequently", and "5: Always". The score ranged from 10 to 50. Respondents scoring a minimum of 40 points (or 80% of the total score) were classified as displaying good compliance, while those scoring below this threshold were categorised as having poor compliance (15).

The main independent variable was COVID-19 vaccination that range from 0 (not vaccinated) to 3 (received the booster vaccination). The HBM variable consists of six variables, which were:

1. Perceived susceptibility or construct perceived vulnerability to personal risk or vulnerability (Cronbach Alpha 0.858; corrected item-total correlation 0.622-0.744); is a person's subjective perception of the risk of his health condition. In the case of medical illness, these dimensions include acceptance of the results of the diagnosis, personal estimation of the existence of re-susceptibility (reappearance of sensitivity), and susceptibility (sensitivity) against disease in general.

2. Perception of severity/seriousness (Cronbach Alpha 0.936; corrected item-total correlation 0.800-0.937) is a feeling about the seriousness of an illness include evaluating its clinical and medical consequences (for example, death, disability, and illness) and possible social consequences (such as effects on work, family life, and social relationships). In general, a condition of acute or chronic pain can change a person's condition, both psychologically and physically. Psychological conditions that may arise are fear, anxiety, or trauma.

3. Health motivation (Cronbach Alpha 0.905; corrected item-total correlation 0.603-929) is related to individual motivation to always live a healthy life. Consisting of control over his health condition and health value.

4. Perceived benefits (Cronbach Alpha 0.920; validity 0.879-0.992) is acceptance of a person's susceptibility to a condition that is believed to cause seriousness (perceived threat) is encouraging to produce a force that supports behaviour change. This depends on a person's belief in the effectiveness of the various available efforts in reducing the threat of disease, or the benefits that perceived benefits in taking these health efforts.

5. Perceived barrier (Cronbach Alpha 0.929; corrected item-total correlation 0.677-0.821) is barriers that are felt to change, or if individuals face obstacles that are found in taking these actions. In addition to the four beliefs or perceptions.

6. Cues to action (Cronbach Alpha 0.989; corrected item-total correlation 0.761-0.921) is behaviour that is influenced by something that becomes a cue for someone to perform an action or behaviour. Signs in the form of external and internal factors, for example messages in the mass media, advice or suggestions from friends or other family members, socio-demographic aspects such as education level, living environment, parenting and parental supervision, association with friends, religion, ethnicity, economic, social, and cultural conditions, self-efficacy, namely a person's belief that he has the ability to perform or display a certain behaviour.

Data Analysis

The results of this study were presented in the form of a path diagram. The collected data were analysed using IBM SPSS version 27 (IBM Corp., USA). Skewness and kurtosis were checked to confirm that the study variables were normally distributed, and a significance level (Alpha) of 0.05 was applied. Descriptive statistics of frequencies and percentages were carried out to describe demographic characteristics and research variables. Multicollinearity is verified using Pearson's correlation coefficient between variables ($r = -0.32 - 0.20$), tolerance less than 0.20 or 0.10, and variance inflation factor (VIF) 5 or 10. Factors that influence adherence to the application of health protocols are analysed using maximum likelihood path analysis. Also, an acceptable fit is confirmed if other indices are included: root mean square error of approximation (RMSEA) < 0.08; comparative suitability index (CFI), fit index (GFI) 0.90; and root mean square standard residual (SRMR) < 0.05.

Ethical Clearance

This study was approved by Research Ethics Committee, Faculty of Health, Universitas MH. Thamrin No 022/S.Ket/KEPK/LPPM/UMHT/VI/2022.

RESULTS

Respondents Characteristics

A total of 601 elderly respondents in urban areas were successfully recruited into this study and the description of the respondents' characteristics are shown in Table I. The majority of elderly interviewed were those aged 60-65 years (55.4%, n=333) while almost a third of the elderly aged 66-70 years (28.3%) and the rest were aged over 70 years. Based on gender characteristics, most of the elderly were women (57.7%, n=347). Meanwhile, the education level that was most widely reported was the elderly who graduated from high school (36.4%, n=219) followed by the elderly attended college or university (22.9%, n=138). As

Table I : Respondents Characteristics

Variable	Frequency	Percentage (%)
Age		
60-65 years old	333	55.4%
66-70 years old	170	28.3%
>70 years old	98	16.3%
Gender		
Male	254	42.5%
Female	347	57.7%
Education background		
College or University	138	22.9%
Primary school	103	17.1%
High school	219	36.4%
Junior high school	104	17.3%
Not attending school	37	6.2%
Occupation		
Daily workers	57	9.5%
Housewife	45	7.5%
Entrepreneur	87	14.5%
Private employee	41	6.8%
Government employee	26	4.3%
Unemployed/Retired	345	57.4%
Smoking History		
Ever smoking	120	19.9%
Never smoking	372	61.9%
Currently as active smoker	109	18.1%
COVID-19 history		
No	458	76.2%
Yes	143	23.8%
Chronic disease history		
1 disease	190	31.6%
> 1 disease	107	17.8%
None	304	50.6%

many as 57.4% (n=345) of the elderly were not working or have retired and 7.5% (n=45) of them were housewives. The rest were elderly who are still self-employed/entrepreneurs (14.48%) or worked as labourers (9.5%), as private employees (6.8%) and as government employees (4.3%). Regarding smoking habits, around one-fifth of the elderly are still smoking (18.1%, n=109) and 19.9% (n=120) were former smokers. The rest are elderly who have never smoked.

Table II : Distribution of Health Protocols Compliance

Score of compliance with health protocols (N=601)	Score
Min	10
Max	50
Mean	37.3
Standard Deviation (SD)	7.1

Category of compliance with health protocols	Frequency (%)
Less Compliance (score ≤40)	332 (55.2%)
More Compliance (score >40)	269 (44.8%)

Table III : Category of Vaccination Status and Reason Not Being Vaccinated

Variables	Frequency (n)	Percentages (%)
Vaccination Status (n=601)		
Never	89	14.8
1st Dose	59	9.8
2nd Dose	237	39.4
Booster Dose	216	35.9
Reason for not being vaccinated (n=89)		
Having comorbidity	46	51.7
Not ready	13	14.6
Fear	13	14.6
Not allowed by the family member	3	3.4
Do not have time	1	1.1
Not answering	13	14.6

During the COVID-19 pandemic, 23.8% of the elderly (n=143) had a history of being infected with COVID-19. As for other diseases, almost a third of the elderly were reported to have 1 type of chronic disease and 17.8% had more than 1 chronic disease. The rest are elderly people who do not suffer from disease.

Compliance with Health Protocols

There were 10 health protocols asked among the elderly in preventing COVID-19, and among them, using face mask when they were outside and washing hands were the most complied protocols as it was reported around 44.6% and 39.9% of them always perform the protocol, respectively. Meanwhile

Table IV : Distribution of Health Belief Model Variables

Health Believe Model Variables	Score				Percentage of Having Good Perception (%)
	Mean	SD	Min	Max	
Perceived barrier	19.2	4.3	6	30	55.2
Perceived benefit	25.1	3.6	12	30	41.3
Health motivation	31.4	4.0	16	40	49.8
Perceived susceptibility	13.4	2.7	4	20	51.1
Perceived seriousness	32.2	4.6	16	40	45.8
Cues for action	19.5	2.9	8	25	49.6

Table V : Correlation between Vaccination Status and the Health Belief Model Variables with the Compliance of COVID-19 Health Protocols

Correlation of some variables with the compliance of COVID-19 health protocols (n=601)	r	p-value
Vaccination dose	0.184	<0.001*
Perceived barrier	0.277	<0.001*
Perceived benefit	0.297	<0.001*
Health motivation	0.383	<0.001*
Perceived susceptibility	0.194	<0.001
Perceived seriousness	0.078	0.068
Cues for action	0.380	<0.001*

Statistical test - Correlation; *p<0.001

cleaning house with disinfectants was the least performed protocol.

The elderly compliance to health protocols was measured by asking how often they have followed health protocols in the past one month. The results of these compliance measurements are tabulated in Table II. The average compliance score of the elderly in this urban area was 37.3 (SD = 7.1), with a minimum score of 10 and a maximum of 50. A minimum score of 10 indicates that the elderly did not comply at all with the health protocol in the last one month. Meanwhile, the maximum value indicates that the elderly always carried out all the health protocols asked. These results were then categorised into less compliance and more compliance using the 40 cut off point (15). The table shows that more than half of the elderly did not comply with the health protocol (55.2%, n=332), while the rest of them were categorised as compliant as they often carried out health protocols in daily life in the last one month when the study was conducted.

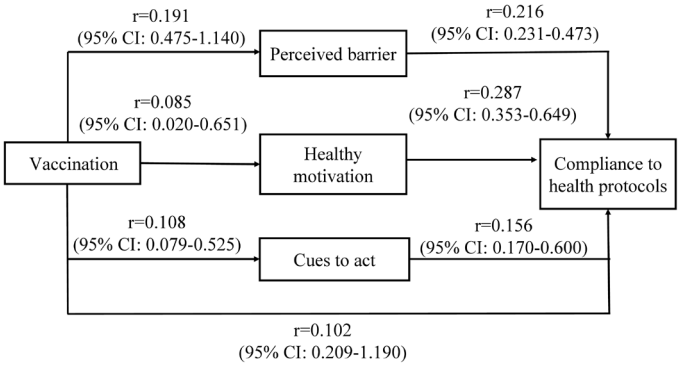

Figure 1 : Path analysis. Diagram shows the direct and indirect correlations between vaccination and compliance to health protocols through the variables of perceived barrier, health motivation and cues to act.

Vaccination Status

Table III shows the vaccination status and reasons for not being vaccinated. Many elderly had received vaccination dose 2 (39.4%, n=237) and around 35.9% (n=216) had even received booster 1 vaccination. Unfortunately, there were still around 14.8% (n=89) of the elderly who had not received vaccination. The reason most of the elderly did not/had not received the vaccine was because they had comorbidities, so they were not recommended by the doctors to be vaccinated (51.7%, n=46), personal judgments that caused the elderly to be unwilling to be vaccinated (14.6%, n=13) and due to having fear of being vaccinated (14.6%, n=13).

The Health Belief Model (HBM) Variables

In addition to vaccination history, other independent variables observed in this study were the six HBM namely perceived barriers, perceived benefits, health motivation, perceived vulnerability, perceived severity/seriousness and cues to act. All these variables were assessed and tabulated in Table IV. The highest mean score was perceived seriousness (32.2; SD = 4.6) followed by health motivation (mean score = 31.4; SD = 4.0).

Correlational Analysis Between Vaccination Status and Health Belief Model Variables Towards the Compliance of Health Protocols

Table V shows that compliance of COVID-19 health protocols having a significant but weak correlation with the vaccination dose (r=0.184), perceived barrier (r=0.277), perceived benefit (r= 0.297), health motivation (r=0.383), perceived susceptibility (r=0.194) and cues for action (r=0.380), p<0.001 respectively.

Path Analysis

The path analysis revealed the underlying correlation between vaccination and elderly compliance to health protocols through the variables of perceived barrier, health motivation and cues to act (Fig. 1). The indirect correlation between vaccination and compliance to health protocols through perceived barriers (vaccination → perceived barriers → compliance to health protocols) has a significant regression value, namely 0.041 (0.191 x 0.216). This regression value is higher than the regression value on the indirect relationship between vaccination and compliance to health protocols through health motivation (vaccination → health motivation → compliance to health protocols), which is equal to 0.024 (0.085 x 0.287) and an indirect correlation through cue variables to act (vaccination → cues to act → compliance to health protocols) of 0.017 (0.108 x 0.156). The magnitude of other effects is explained by the direct correlation between vaccination and compliance to health protocols in the elderly of r=0.102 (95% CI: 0.209 – 1.190). The more doses of vaccination received by the elderly, can increase the score of perception of barrier, the score of health motivation and the score of cues to act which in turn can increase the score of compliance to health protocols.

DISCUSSION

More than half (55.2%) of the elderly in urban areas reported having poor compliance in implementing COVID-19 protocols. This finding is quite understandable since during the data collection process (July-October 2022), the situation of COVID-19 in Indonesia has fully controlled. As reported by the National Task Force of COVID-19 (1) there was around 2000-6000 daily cases during that time with the low case fatality rate (2.5%). During that period of time, the public policy regarding the COVID-19 control and prevention has also changed. The government of Republic Indonesia has dismissed the National COVID-19 Task Force and started to focus on the recovery of COVID-19 related impact on economic, health services and other health impact. Even though the COVID-19 outbreak status in Indonesia has not been repealed yet, but the community have been perceiving that the COVID-19 is no longer a health threatening issue hence might indeed lowered their compliance in its prevention efforts. The elderly compliance during the new norm era is considered lower compared to the compliance as previously reported among the general population which was around 74.5% (16). Our finding also was in contrast to the study conducted in Spain that reported the level of compliance towards the protective measures remained high among the elderly during the new normal era (83.4%). It is assumed that their findings correlated with the higher level of fear among this group compared to any younger groups (17).

More than one-third of the elderly in this study has received the completed and booster dose of COVID-19 vaccine. Since February 2021, the Ministry of Health Regulation 10/2021 has been prioritising elderly population and some other groups such as health workers, geospatial and socially vulnerable community to receive the first dose of COVID-19 vaccine. For the fact that, the elderly kept been prioritised to get the second and booster vaccination as well. Currently, the COVID-19 vaccination coverage among elderly has passed the national target vaccination (3). Nikolovski et al (18) stated that the beliefs about the safety and efficacy of COVID-19 vaccine, and whether a COVID-19 vaccine will help to protect an individual and others were the strongest factors influencing the willingness to get vaccinated. However, about 15% of the elderly in this current study had not received vaccination, mostly due to comorbidities. This is supported in a recent review by Chen (19) discussing the challenges of COVID-19 vaccination and existing frailty among the vulnerable elderly populations as they have limited mobility hence prone to cross-infections from their caregivers, limited clinical efficacy of vaccine due to their lower immunogenicity and greater risk of exacerbating adverse effects post-vaccine. Therefore, a lot of factors need to be considered despite the priorities given by the governments among the elderly to receive vaccination. This study also found that the more elderly received vaccine shots, the higher the score of COVID-19 compliance (r= 0.102; 95% CI 0.209-1.190) (Fig. 1). This finding is relevant with the study conducted in Italy that people who received second dose of vaccination will perform more adherence on some COVID-19 protective behaviours such as hand washing and wearing mask (20). According to the Health Belief Model (served as a theoretical framework of this study), vaccination affecting the compliance of performing COVID-19 protocol among the elderly in this study were through three main pathways namely the perceived of barrier, health motivation, and cues for action.

Perceived of Barrier Mediated the Correlation Between Vaccination and COVID-19 Protocol Compliance

Elderly who received more vaccination shots having higher score for perceived of barrier and it led to be more complied in performing COVID-19 prevention.

It implies that among elderly in this study who had been vaccinated, their perceived of barrier was lower. Elderly who was not vaccinated, depended on other people to implement the preventive behaviour as they wait for other people to ask them to perform the activities. This issue might be particularly caused by the frailty of the elderly, as around 49.4% reported having chronic disease(s) history. Number of disease history among elderly without vaccine is two times higher compared to the elderly that has been vaccinated. Since they are not eligible to get vaccine, therefore, they were in poor medical condition that not allowing them to interact/socialise with others hence it may lead them to not wearing the protective equipment. A study conducted in the United Kingdom revealed that social norms and social pressures related to challenges resisting social pressure to break rules from family and friends, and well as the specific demotivation of seeing non-compliance among the general public and members of the government (21).

As discussed previously, most barrier that elderly experienced usually coming from surrounding people. Therefore, educating their nucleus family and close friends/neighbourhood is crucial. During COVID-19, the Indonesian government has executed the RW Siaga (preparedness) programme across country. RW Siaga is defined as a neighbourhood whose residents have the readiness of resources, ability, and willingness to prevent and deal with health problems, disasters, emergencies, or extraordinary events independently, including for the COVID-19 control and prevention. This is a community-based programme that empowering people within neighbourhood to observe, endorse and encourage its people to do preventive behaviour of COVID-19. In addition to that, perceived of barrier is lower since the access for vaccination was made easy. Not only providing the vaccination inside the building, Primary Health Center also open the vaccination center in the middle of community or locally known as Posbindu, and sometimes they directly pay a visit to the elderly' house if the elderly could not attend the local vaccination center/Posbindu. Such initiatives and government's effort via such programmes, indeed, inserted the socialisation of COVID-19 prevention and its important.

Health Motivation Mediated the Correlation Between Vaccination and COVID-19 Protocol Compliance

Health motivation is bridging the correlation between vaccination and compliance to health protocol (r=0.019). Getting vaccinated will increase health motivation and it causes the increase of COVID-19 preventive compliance. This finding is supported by the Alagili and Bamashmous (22). The possible underlying factor related to this finding might be due to the history of COVID-19 infection. Although the results were not tabulated in the table, bivariate analysis was conducted and found the number of vaccinated elderlies among those who had experienced COVID-19 (90.9%) was significantly higher than those who had never been infected (83.4%) (p=0.027). The elderly might have strong motivation in protecting themselves to not being re-infected by being responsible, hence taking a good care of their own health and believe that health lifestyle will prevent them from COVID-19 infection. The factor of wanting to be a good role model for their surrounding social environment in implementing the COVID-19 protocol might also be the contributing factor, and it's called a prosocial motivation.

To have prosocial motivation means that people are inspired to act based on concern for others, empathy, in the sense of perceiving the needs and perspectives of others, and altruism, in the sense of desiring to help others without aiming for self-benefit. Previous study on compliance has revealed that people opted to engage in protective activity based on a deliberate assessment of costs and rewards. While advantages of compliance (e.g., reducing infection rates) are shared by both the individual and community, costs are frequently suffered by the person engaging in the protective action (e.g., the negative effects of self-isolating or wearing a facemask). Compliance may thus be considered as at least as a component of a prosocial act (23).

According to self-determination theory, there are two types of motivation, the autonomous and regulated motivation. Being autonomously motivated involves feeling a sense of choice and volition as the person completely endorses one's own actions or decisions. To illustrate, citizens respecting physical distance would do so because they fully identify with the value of the behaviour. In contrast, controlled motivation means that the person engages in each behaviour because one feels pushed and pressured to do so. This study found that the elderly respondents in urban area in Greater Jakarta having autonomous motivation similar to Morbйe et al. (24) research findings among Belgian people that both interpersonal and week-to-week fluctuations in autonomous motivation predicted persistent adherence to COVID-19 measures over time.

Compliance with infection control measures that required change of everyday behaviour is likely to be determined by a variety of factors such as habits, social norms, structural constraints, and random factors. The extent that people make rational choices about compliance is determined by the goals they set and their motivation to follow those goals (23).

Cues to Action Mediated the Correlation Between Vaccination and COVID-19 Protocol Compliance

The results of this study showed that there was

significant correlation between cues to act and scores of compliances to health protocols among the elderly (r 0.308, p<0.001) which is relevant with previous study (25) that cues to act had a significant influence on community compliance in implementing the COVID-19 health protocol (p=0.003). Similarly, Rochmah (26) stated that cues to action in the form of family, friends, neighbours, community leaders, and government supports can influence an individual to complying with health protocols. Likewise, other previous studies (27, 28) also reported that as the internet, social media and television are becoming such an important source of information, cues to act in the form of information dissemination from people closest to the elderly via the said channels, or from health services had become the way forward of promoting healthy behaviour in preventing COVID-19. The higher the signal to act that a person has, the more preventive actions taken by individuals, in this case the elderly, in breaking the chain of COVID-19 by complying with health protocols.

Strength and Limitation of Study

Several studies related to compliance with health protocols among the elderly in Indonesia have mainly focused on predictive factor analyses (8, 29). In contrast, this research investigates how the vaccination history pathway can influence the elderly's compliance with health protocols. This is crucial as it provides empirical evidence to support the policy of mandatory COVID-19 vaccination in the post-pandemic era.

However, one limitation of this study is its relatively weak temporal ability due to the use of a cross-sectional design. Consequently, the exact temporal relationship between exposure (particularly for HBM variables) and the observed outcome cannot be clearly determined, leading to ambiguity in establishing causality. Nevertheless, efforts have been made to minimise this limitation by setting a specific time frame during the interview process.

CONCLUSION

The current study has fulfilled the research objective in determining the relationship between the effect of vaccination and compliance to health protocols among the elderly utilising the HBM approach. It can be concluded that, the results of this study have proven that the HBM is effective in predicting the elderly compliance towards implementing health protocol. Although the elderly in this study reported to be less compliant (55.2%) towards health protocols however the vaccination variable and the six HBM constructs studied, namely perception barriers, perceived benefits, health motivation, perceived vulnerability, perceived severity, and cues to act have a weak but significant correlation with health protocols compliance among the elderly. Path analysis also yielded indirect correlation between HBM variables through perceived of barrier, health motivation and cues for action. As recommendation, government could improve the coverage of booster vaccination in order to maintain the compliance of COVID-19 health protocol among elderly.

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