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Relationship of spirituality, health engagement, health belief and attitudes toward acceptance and willingness to pay for a COVID-19 vaccine

--Manuscript Draft--

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Full Title:	Relationship of spirituality, health engagement, health belief and attitudes toward acceptance and willingness to pay for a COVID-19 vaccine
Short Title:	Acceptance and Willingness to Pay for a COVID-19 Vaccine
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Keywords:	acceptance; Health belief model; health engagement; spirituality; vaccine COVID-19.
Abstract:	Purpose: To explore the wider determinant factor of citizens' spirituality, health engagement, health belief model, and attitudes towards vaccines toward acceptance and willingness to pay for a COVID-19 vaccination. Methods: A community-based cross-sectional online investigation with convenience sampling was utilized to recruit 1423 citizens from 18 district across Indonesia between December 14, 2020 and January 17, 2021. Descriptive statistics, One-way analysis of variance, Pearson correlation, Independent t-tests, and multiple linear regression were examined. Results: Spirituality, health engagement and attitude toward vaccine, as well as health beliefs constructs (all score of perceived benefits and barriers) were significant key factors of acceptance vaccine. Interestingly, the spirituality, attitude toward vaccine, and health beliefs constructs including perceived susceptibility, and benefits indicated a significantly higher willingness. Conclusions: Results demonstrated the utility of spirituality, health engagement, health belief model, and attitudes towards vaccines in understanding acceptance and willingness to pay for a vaccine. Specifically, a key obstacle to the acceptance of and willingness to pay COVID-19 vaccination included a high score of the perceived barrier construct. Moreover, the acceptance of and willingness to pay could be impaired by worries about the side-effects of a COVID-19 vaccination.
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Response to Reviewers:	RE: [PONE-D-22-14548] - [EMID: ccb1e548dd430d0c]-Version 1 Response to Reviewer 1 Comments Dear Reviewer #1, Thank you for considering our manuscript and for the valuable suggestions, also the opportunity to resubmit a revised manuscript, which helps us to improve the article. We carefully revised the manuscript in accordance with your comments. The revised sections of the manuscript are marked with red color. Our point-by-point responses to the comments are as follows. We very much hope the revised manuscript is accepted for publication in PLOS ONE. Thank you very much for your consideration.

Point 1. Please carry out an extensive English language editing.
Response 1: Thank you for your valuable suggestion. This revised manuscript was edited by Taipei Medical University Academic Editing.

Point 2. The methodology, already compromised using a convenient sampling technique, needs further justification as to how the single responder did not use multiple social media platforms to respond to your questionnaire.
Response 2: Thank you for your comments. With the issue of duplicate response, we used participants email to avoid overlapping response during data collection (Please see line 139-140 on page 6)

Point 3. There are numerous limitations to your study, especially with regards to the generalizability of the findings and also the validity of the tools used for assessment.
Response 3: Thank you for your comments. We add several new information to clarify and revise this point to make it clearer and more precise based on the reviewer's suggestion as follows:
Generalizability:
"The sample size was calculated based on estimates from the distribution of the general population as reported by the Central bureau of statistics, Indonesia. Proportions from eastern, central and western regions of Indonesia are reported at 2.76%, 16,14% and 81.10% respectively [38]. In our study, we reached participants from all regions of Indonesia and obtained 11.9%, 16.9% and 71.2% from each base, which has a similar pattern to the proportional distribution of these regions in the general population" (Please see line 240-245 on page 10).
"Another limitation was a lack of citizens' prevalence from the eastern and central region and an International Standard Classification of Education of <3 education level, as this may implicate the generalizability of the findings and which future research might specifically seek to enroll. However, we adjusted for a considerable number of potential confounding factors to be obtained by performing a multiple linear regression, thus minimizing the effect of an unequal distribution" (Please see line 428-433 on page 19).

Validity of the tools used for assessment
In our manuscripts we already mention content validity index (CVI) and kappa (k*). Moreover, we add new result of The Kaiser-Meyer-Olkin (KMO), kappa, Bartlett's tests of sphericity, a Cronbach's alpha and item-total correlation analysis were used to determine validity and reliability of the tools used for assessment (Please see line 191-194 on page 8).

Point 4. Please add a section on the validity of the assessment tool utilized.
Response 4: Thank you for your valuable comment and suggestion. In this revised manuscript, we added a description to make clear the validity of the assessment tool utilized based on the reviewer's suggestion as follows in the section of the methods of our study.

"Further, we reviewed cognitive debriefing results and the finalized version with content validity index (CVI) and kappa (k*). Finally, we conducted an analysis of the reliability and validity with the Kaiser-Meyer-Olkin (KMO) test, the Bartlett's test of sphericity value, Cronbach's alpha and item-total correlation coefficient" (Please see line 191-194 on page 8).

"In our study, HE questionnaire English was translated into Indonesian and had a CVI of 0.93, k* of 0.94 to 1, the value of the KMO test was 0.72 and the Bartlett's test of sphericity value was significant (p < 0,001). Furthermore, Cronbach's alpha of 0.91 with item-total correlation coefficient score was 0.68 to 0.88" (Please see line 200-204 on page 8).

"The Indonesian version of the VAs questionnaire had an acceptable CVI 0.95 with k* of 0.98 to 1. The value of the KMO test was 0.69 and the Bartlett's test of sphericity value was significant (p < 0,001). Furthermore, a total Cronbach's alpha of 0.70 with item-total correlation coefficient score was 0.60 and 0.68 in our study" (Please see line 212-216 on page 9).

	“In our study, the questionnaire of the HBM Indonesian version presented that the CVI was 0.95 with k* of 0.89 to 0.92. The value of the KMO test was 0.61 and the Bartlett’s test of sphericity value was significant (p < 0,001). Furthermore, a total of Cronbach's alpha of 0.81 with item-total correlation coefficient score was 0.63 to 0.71” (Please see line 225-229 on page 9-10). Point 5. Please be consistent in using the terms; multivariate and multiple regression, both have different understanding. Response 5: Thank you for your valuable comment and suggestion. We revised “multivariate regression” to “multiple regression” (Please see abstract, line 38 on page 2). Point 6. Please avoid using abbreviations in the abstract. Response 6: Thank you for your valuable comment and suggestion. We appreciate this reviewer’s comment. In this revised manuscript, we avoid using abbreviations in the conclusions of abstract section. “Conclusions: Results demonstrated the utility of spirituality, health engagement, health belief model, and attitudes towards vaccines in understanding acceptance and willingness to pay for a vaccine. Specifically, a key obstacle to the acceptance of and willingness to pay COVID-19 vaccination included a high score of the perceived barrier construct. Moreover, the acceptance of and willingness to pay could be impaired by worries about the side-effects of a COVID-19 vaccination” (Please see abstract, line 45-50 on page 2). Point 7. Please elaborate on the implications of the findings from your investigation. Response 7: Thank you very much. We appreciate this reviewer’s comments. In this revised manuscript, we added a description about implications of this study as follows in the section of the conclusion “Our findings offer to health professionals including nursing identifying and incorporating clinical counseling interventions strengthening HE, AVs, HBM, and spirituality to successfully boost the acceptance and willingness to pay. Furthermore, it provided to government policy-making to boost citizen's immunization programs. The data gathered from this survey would provide scientific evidence for developing targeted programs to improve acceptance and willingness to pay vaccine and enhance vaccine management strategic decisions for current and future” (Please see abstract, line 443-449 on page 20). ----------thank you---------- Response to Reviewer 2 Comments Dear Reviewer #2, Thank you for considering our manuscript and for the valuable suggestions, also the opportunity to resubmit a revised manuscript, which helps us to improve the article. We carefully revised the manuscript in accordance with your comments. The revised sections of the manuscript are marked with red color. Our point-by-point responses to the comments are as follows. We very much hope the revised manuscript is accepted for publication in PLOS ONE. Thank you very much for your consideration. Point 1. In the abstract. All abbreviations should be defined. Response 1: Thank you very much. We appreciate your comment. In this revised manuscript, we avoid using abbreviations based on reviewer’s comment and provide full name of the abbreviations in the abstract section as follows; “Conclusions: Results demonstrated the utility of spirituality, health engagement, health belief model, and attitudes towards vaccines in understanding acceptance and willingness to pay for a vaccine. Specifically, a key obstacle to the acceptance of and willingness to pay COVID-19 vaccination included a high score of the perceived barrier construct. Moreover, the acceptance of and willingness to pay could be impaired by worries about the side-effects of a COVID-19 vaccination” (Please see abstract, line 44-49 on page 2). Point 2. If supported by the journal format. I recommend the authors to make a list of

abbreviations.
Response 2: Thank you for your valuable comment and suggestion. All abbreviations have been explained at the beginning of the previous sentences follow the submission guidelines as follows;

Abbreviations: Adjusted beta coefficients (); Content validity index (CVI); Confidence intervals (CIs); Coronavirus disease 2019 (COVID-19); Daily spiritual experiences scale (DSES); Exploratory factors analysis (EFA), Health belief model (HBM); Health engagement (HE); IDR = Indonesian rupiah; ISCED = International standard classification of education; Kaiser-Meyer-Olkin (KMO); One-way analysis of variance (ANOVA); Perceived barriers (PBA), Perceived benefits (PBE); Perceived severity (PSE); Perceived susceptibility (PSU), Standard deviation (SD), Vaccine attitudes (AVs); Variance inflation factor (VIF); World Health Organization (WHO).

Point 3. The English should be checked and revised. The use of decimal separator should be taken carefully, such as “50.404 having died”.
Response 3: Thank you for your valuable comments and suggestions. In order to make data better presented, we reorganized the sentences based on the reviewer’s suggestion.

“Additionally, this disease has spread to Indonesia, where approximately 1,816,041 people are reported to be infected, with 50,404 deaths” (Please see line 61-63 on page 3)

Point 4. The logical flow is confusing, for instance paragraph 1 and 2 in the introduction.
Response 4: Thank you for your valuable comment. In order to make manuscripts to be better presented with precise and logical flow, we re-organize the sentences (paragraph 1 and 2) based on the reviewer’s suggestion as follows;

“COVID-19 caused clusters of a complex respiratory syndrome characterized with a novel beta-coronaviruses infection [1]. As of May 31, 2021, the WHO confirmed that 170,051,718 individuals had been infected with COVID-19 worldwide [2]. Additionally, this disease has spread to Indonesia, where approximately 1,816,041 people are reported to be infected, with 50,404 deaths [3]. After scientists discovered this new SARS-CoV-2 strain, vaccines for COVID-19 were rapidly developed to be distributed globally [4, 5]. While vaccine programs could substantially alleviate the spread of the virus, one of the problems for policymakers is determining how to motivate their citizens to get vaccinated. Most vaccine skeptics refuse to be vaccinated [6]. Interestingly, Indonesia is unique because citizens typically have extremely spiritual beliefs, health attitude issues [7], and differences in health perspective [8], which may influence acceptance and willingness to pay COVID-19 vaccine.” (Please see paragraph 1 in the introduction, line 59-69 on page 3)

Point 5. Statement “Vaccine acceptance and willingness to pay..” needs citation. I recommend: Sallam et al. Narra J 2022; 2(1): e74 – doi: 10.52225/narra.v2i1.74
Response 5: Thank you for your valuable comment and suggestion. In this revised manuscript, we added a new reference number10 based on reviewer’s suggestion as follows;

“Acceptance and willingness to pay for a COVID-19 vaccine are critical to the success of a high-coverage vaccination program [9, 10]” (Please see line 71 on page 3)

Point 6. After this full sentence, “Recent studies shown that the acceptance of vaccination…” I recommend to include this study because it longitudinally compare data from multiple countries Rosiello et al. Narra J 2021; 1(3): e55-doi: 10.52225/narra.v1i3.55
Response 6: Thank you for your valuable comment and suggestion. In this revised manuscript, we added an information and new reference based on reviewer’s suggestion as follows;

“Moreover, an epidemiological study in low- or middle-income countries such as Bangladesh, India, Iran, Pakistan, Egypt, Nigeria, Sudan, Tunisia, Brazil, and Chile presented that the acceptance of vaccination was approximately 58.3 % to 80.1%”

(Please see line 73-76 on page 3)

Point 7. Introduction is too long. Many redundant paragraphs, I recommend to trim some of them.
Response 7: Thank you for your valuable comment. In order to make data better presented, we reorganized (which were marked with red color) and trimmed some descriptions based on the reviewer's suggestion (Please see introduction section, line 59-118 on page 3-5).

Point 8. "18 provinces in Indonesia" out of how many provinces?
Response 8: Thank you for your valuable comment. In this revised manuscript, we added an information based on reviewer's suggestion as follows;

"A cross-sectional online-based overview during COVID-19 for 18 provinces out of 34 provinces in Indonesia" (Please see line 122-123 on page 5)

Point 9. "the most accessible online media networks used by Indonesian citizens" Needs citation or removed.
Response 9: Thank you for your valuable comment and suggestion. We removed "the most accessible online media networks used by Indonesian citizens" based on the reviewer's suggestion.

Point 10. "Indonesian citizens" What parameters determine the participants are Indonesian citizens. Do you have any specific inclusion/exclusion criteria for the citizenship?
Response 10: Thank you for your valuable comment. In this revised manuscript, we added an information based on reviewer's suggestion as follows;
Indonesian citizens parameters are the original Indonesians and foreign nationals who are legally recognized as Indonesian citizens currently live in Indonesia.

"The eligible target population was Indonesian citizens aged 17 until 65 years, who understood Bahasa Indonesia, currently stay in Indonesia, and filled the consent form. Citizens who had previously been confirmed with suspected COVID-19 was excluded" (Please see line 124-126 on page 5)

Point 11. "1,423 samples" how this number is determined?
Response 11: Thank you for your valuable comment. In this revised manuscript, we added a sample size calculation based on reviewer's suggestion as follows;

"Sample size was estimated based on previous study [36] with the formula; n = uap (1 – p)/δ2, where n = minimum desired sample size, ua = the standard normal deviation, usually set as 1.96 which corresponds to 5% level of significance. p = the average rate of acceptance of vaccine was estimated on the basis of the available literature and its value was set at 85% [37], δ = of precision set at 0.015. The calculated minimum sample size was 1,111 (n = 1.96 x 0.85 x (1- 0.85)/0.0152 = 1,111). We expected a potential missing data of 20% with a large population and thus aimed to recruit at least 1,388 participants. Finally, during one-month data collection, the total sample consisted of 1,423 Indonesian citizens" (Please see line 232-239 on page 10).

Point 12. Include the p value when describing the results. Add 0 before (.) in decimal
Response 12: Thank you for your valuable comment and suggestion. In order to make data to be better presented, we add "0" before "." in decimal (results p value) based-on the reviewer's suggestion (Please see Table 1, line 276-78 on page 11-12; Table 2, line 290-292 on page 13, Table 3, line 314 on page 14).

Point 13. In the table footnote, authors indicate * for statistically significant at $p<0.05$ and ** -- at $p<0.001$. But no asterisk was put on the table data.
Response 13: Thank you for your valuable comment. In this revised manuscript, we deleted "* p<.05; ** p<.001" in Table 1 footnote (Please see the footnote of Table 1; line 280 on page 12).

Point 14. The data are too many and confusing. Please only include significant data on the paper. The rest can be put in Supplementary file. Regardless, this is just a

suggestion.
Response 14: Thank you for your valuable comment and suggestion. In order to make manuscripts to be better presented, we organize all data results and several data put in supplementary file based on the reviewer's suggestion (Please see results sections; line 271-347 on page 11-16).

Point 15. Again. The discussion has rather confusing logical flows. For example, the authors highlight the significance of their work at the beginning of the subsection. This leads the explanations to obtain inadequate comparison. In addition, authors may divide the discussion into several subsections.
Response 15: Thank you for your valuable comment. In order to make manuscripts to be better presented with precise and logical flow, we reorganize and divide the discussion into several subsections based on the reviewer's suggestion (Please see line 350-420 on page 16-19).

Point 16. "Indonesia has a diverse culture and extremely unique spiritual belief…." Is it possible the data could be biased because of such extreme heterogeneity? If yes, how did author overcome this? Where are the underlying data? Otherwise the reasons are stated, the journal requires the publication of underlying data.
Response 16: We appreciate your insightful comments. The Daily Spiritual Experiences Scale (DSES) questionnaire is often used in epidemiological research, and people of different religions, cultures, and traditions have been suggested as a reason why.
The DSES instrument (Underwood and Teresi 2002; Underwood 2006) was designed on the basis of extensive research involving analysis of sources from theology, religion, and social sciences, investigation of spirituality measurements, in-depth interviews and focus groups with people from different religions, cultures, traditions. The DSES instrument was developed to assess the daily frequency of specific experiences of spirituality and interaction with transcendence. Items are designed to measure spiritual experience, not beliefs or behavior based on religious and spiritual doctrines. Spiritual experiences may be evoked by a religious context or by daily events, individual religion or religious or spiritual beliefs. Moreover, The DSES is composed of various concepts: transcendent connection, the support provided by God, divine or transcendent, inner peace and harmony, interconnectedness with all living things, reverence for beauty, gratitude, compassion, mercy, and the desire to be closer to God.
The tool is validated in many languages, widely used and applicable to people with different religious traditions or atheists or agnostics (Underwood 2006; Ellison and Fan 2008; Kalkstein and Tower 2009; Ng et al. 2009; Bailly and Roussiau 2010; Sánchez et al. 2010; Underwood 2011; Loustalot et al. 2011; Kimura et al. 2012; Rakošec et al. 2015; Lo et al. 2016).
----------thank you----------

Response to Reviewer 3 Comments
Dear Reviewer #3,
Thank you for considering our manuscript and for the valuable suggestions, also the opportunity to resubmit a revised manuscript, which helps us to improve the article. We carefully revised the manuscript in accordance with your comments. The revised sections of the manuscript are marked with red color. Our point-by-point responses to the comments are as follows. We very much hope the revised manuscript is accepted for publication in PLOS ONE. Thank you very much for your consideration.

Point 1. The title should be changed since this study was a cross sectional study therefore it is not possible to measure the impact or effect and it is advised to change the titled to the relationship rather than measuring the effect
Response 1: Thank you for your valuable comment and suggestion. We re-word "The effect" to "Relationship" based on the reviewer's suggestion in the title section.

"Relationship of spirituality, health engagement, health belief and attitudes toward acceptance and willingness to pay for a COVID-19 vaccine"

Point 2. Research objectives are not clearly stated in the introduction section and that way it is advised to revise and mention about related research objective
Response 2: Thank you for your valuable comment and suggestion. In order to make manuscripts to be better presented with precise and logical flow, we organize the

	research objective based on the reviewer's suggestion as follows; "To fill these gaps, this study explored how Indonesians accepted the COVID-19 vaccine and their willingness to pay for it. This was accomplished by surveying their spirituality, HE, HBM constructs, and AVs" (Please see line 116-118 on page 5). Point 3. it is required to provide scientifically calculation for sample size for the study Response 3: Thank you for your valuable comment. In this revised manuscript, we added a sample size calculation based on reviewer's suggestion as follows; "Sample size was estimated based on previous study [36] with the formula; n = uap (1 – p)/δ2, where n = minimum desired sample size, ua = the standard normal deviation, usually set as 1.96 which corresponds to 5% level of significance. p = the average rate of acceptance of vaccine was estimated on the basis of the available literature and its value was set at 85% [37], δ = of precision set at 0.015. The calculated minimum sample size was 1,111 (n = 1.96 x 0.85 x (1- 0.85)/0.0152 = 1,111). We expected a potential missing data of 20% with a large population and thus aimed to recruit at least 1,388 participants. Finally, during one-month data collection, the total sample consisted of 1,423 Indonesian citizens." (Please see line 232-239 on page 10). Point 4. data collection procedures should be explained in details and it is not clear what does it mean researchers technological and personal networks please elaborate more on this section Response 4: Thank you for your valuable comments and suggestions. In order to make manuscripts to be better presented with precise and detail, we reorganize the data collection procedures based on the reviewer's suggestion as follows; "The online survey was distributed using a Google Form link that was shared on social media platforms including WhatsApp, Instagram, Telegram, and Facebook. Furthermore, this relies on researchers' technical and personal networks and engaging with and distributing the survey through social media influencers and community leaders. Participants were selected for the study using a simplified snowball sampling technique, and they were asked to forward the invitation to their contacts; the estimated completion time for the survey was 15 minutes. We conducted different procedures to target as many respondents as possible from across the region during the December 15, 2020 to January 12, 2021 data collection period. Finally, 1,423 people responded to our Google form" (Please see line 131-140 on page 6) "The Google Form link had four sections. (1) Before allowing participants to proceed to the survey questions, the first section informed them of the objective of the study and eligibility requirements. Furthermore, the informed consent was taken by checking the box "Agree," which was required to confirm that they understood the authorization information and met the inclusion and exclusion criteria. Additionally, participants decided to participate voluntarily and with the freedom to withdraw at any time; (2) Second section comprised questions correlated to sociodemographic; (3) Third section comprised questions that assessed the intention to accept being vaccinated and willingness to pay for vaccinated; (4) Fourth section contained 35 questions including HE, AVs, HBM, and spirituality questionnaire. Finally, a page at the end expressed our gratitude, and all individuals who completed the survey were encouraged to persuade new respondents from their contact lists to participate by forwarding the link to the online survey" (Please see line 141-152 on page 6) Point 5. Most of explanation on their data collection procedures is related to explaining different section of the questionnaire rather than the process of data collection Response 5: Thank you for your valuable comments and suggestions. In order to make manuscripts to be better presented with precise and detail, we reorganize the data collection procedures based on the reviewer's suggestion as follows; "The online survey was distributed using a Google Form link that was shared on social media platforms including WhatsApp, Instagram, Telegram, and Facebook. Furthermore, this relies on researchers' technical and personal networks and engaging with and distributing the survey through social media influencers and community leaders. Participants were selected for the study using a simplified snowball sampling technique, and they were asked to forward the invitation to their contacts; the

estimated completion time for the survey was 15 minutes. We conducted different procedures to target as many respondents as possible from across the region during the December 15, 2020 to January 12, 2021 data collection period. Finally, 1,423 people responded to our Google form" (Please see line 131-140 on page 6)

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Point 6. It is not mention about the process of translation since the original question are were in English the process of cross-cultural adaptation should be explained in details like forward backward translation cognitive debriefing
Response 6: Thank you for your valuable comment and suggestion. In this revised manuscript, we added a description to make a clear the process of cross-cultural adaptation based on the reviewer's suggestion as follows;

"In the present study, the questionnaires including HE, AVs, and HBM were assessed for the translation process. After obtaining approval from the original authors, the questionnaires (HE, AVs, and HBM) were independently translated into Indonesian using the forward and back-translation methods. The questionnaires were translated by five translators, a certified translator and four experts in nursing research in Indonesian universities, whose native language was Indonesian and who were bilingual and fluent in English. The translators were assessing the questionnaire items to be relevant to measure the HE, AVs, and HBM toward acceptance and willingness to pay a COVID-19 vaccination precisely for linguistic and conceptual equivalence. In brief, Indonesian-speaking academics were first contacted to review the translated version for grammatical accuracy and clarity. Thus, four independent bilingual translators completed the back translation of the Bahasa edition into English. In addition, the final Bahasa version was obtained by comparing the original questionnaire with its back translation. Translators were instructed to avoid metaphors, colloquial terminology, and hypothetical statements, and to use simple sentences. Initially, prior to completing the formal online survey, we conducted a pilot study with 60 residents in the close surroundings of the researchers to determine the questionnaire's readability and reliability". Further, we reviewed cognitive debriefing results and the finalized version with content validity index (CVI) and kappa (k*). Finally, we conducted an analysis of the reliability and validity with Kaiser-Meyer-Olkin (KMO) test, the Bartlett's test of sphericity value, a Cronbach's alpha and item-total correlation coefficient" (Please see line 175–194 on page 7-8).

Point 7. It is required to mention about the scoring of all instruments
Response 7: Thank you for your valuable comment and suggestion. In this revised manuscript, we mention the scoring of all instruments based on the reviewer's suggestion.

"The total score ranges from 1 to 5, a higher score indicated a more-favorable attitude to acceptance a COVID-19 vaccine" (Please see line 161-162 on page 7).

"The total score ranges from 1 to 5, the higher the score an individual has, the greater their willingness to pay for a vaccine" (Please see line 166-167 on page 7).

"The total score ranges from 16 to 96, the greater the number of experiences points a person has, the greater their spirituality. Participants' overall spirituality was categorized, as high if the score was 72, and low if the score was <72 [7]" (Please see line 172-174 on page 7).

	"The total score ranges from 6 to 30, a greater value indicating greater HE [24]. Interestingly, we defined HE score with response as continuous data on five-point Likert scale; 1 (definitely disagree) to 5 (strongly agree). Also, we defined HE scores as categorical data for disagreement (definitely disagree/disagree/strongly disagree) and agreement (agree/strongly agree) presented in S1 Table" (Please see line 196-200 on page 8). "The total score ranges from 2 to 10, a greater value indicating greater AVs. For our study analysis, we defined AVs score with response as continuous (total score). Also, we defined VAs scores involving the agreement (strongly agree/agree), and disagreement (neither agree nor disagree, strongly disagree/disagree) presented in S1 Table" (Please see line 206-210 on page 9). "Response this statement was ranked on a 7-point Likert-scale; 1 (strongly disagree) to 7 (strongly agree) [35]. Also, HBM constructs were used in COVID-19 vaccinations previous research [9, 32]. The total score ranges from 12 to 84, a higher score indicates a good health belief, except for the PBA construct. In the present study, we defined HBM score with response as continuous data or total score in each construct. Moreover, the detailed HBM constructs score involve the agreement (somewhat agree/agree/strongly agree), and disagreement (somewhat disagree/disagree/ strongly disagree /neither agree nor disagree) presented in S2 Table" (Please see line 219-225 on page 9). Point 8. Results of face and content validity should be elaborated by using content validity index and Kappa Response 8: Thank you for your valuable comment and suggestion. We added a kappa results to make a clear the results of face and content validity based on the reviewer's suggestion as follows; "HE questionnaire English was translated into Indonesian and had a CVI of 0.93, k* of 0.94 to 1" (Please see line 200-201 on page 8). "The Indonesian version of the VAs questionnaire had an acceptable CVI 0.95 with k* of 0.98 to 1" (Please see line 212-213 on page 9). "The questionnaire of the HBM Indonesian version presented that the CVI was 0.95 with k* of 0.89 to 0.92" (Please see line 226-227 on page 9). Point 9. For the reliability analysis reporting only Alpha Cronbach is not adequate and it is advice also to mention about the total item correlation for each indicator Response 9: Thank you for your valuable comment and suggestion. In this revised manuscript, we added a description to make a clear the reliability analysis report based on the reviewer's suggestion as follows; HE questionnaire: "the value of the KMO test was 0.72 and the Bartlett's test of sphericity value was significant ($p < 0,001$). Furthermore, a Cronbach's alpha of 0.91 with item-total correlation coefficient score was 0.68 to 0.88" (Please see line 201-204 on page 8). AVs questionnaire: "The value of KMO test was 0.59 and the Bartlett's test of sphericity value was significant ($p < 0,001$). Furthermore, a total Cronbach's alpha of 0.70 with item-total correlation coefficient score was 0.60 and 0.68 in our study" (Please see line 213-216 on page 9). HBM questionnaire: "The value of KMO test was 0.61 and the Bartlett's test of sphericity value was significant ($p < 0,001$). Furthermore, the total Cronbach's alpha of 0.81 with item-total correlation coefficient score was 0.63 to 0.71" (Please see line 227-229 on page 9). Point 10. What is "AVs uses "in page 9 Response 10: Thank you for your valuable comment. We revised "AVs uses" to "Vaccine attitudes (AVs) consists of…" (Please see line 205 on page 9).

	Point 11. Since in this study parametric tests were applied, it is required to mention about the normality test of distribution for all research variables. Response 11: Thank you for your valuable comment. In this revised manuscript, we added the normality test of distribution for all research variables through skewness and kurtosis test based on the reviewer's suggestion as follows; "Absolute values for skewness and kurtosis were used to assess normality of the data; skewness value of -0.264 and kurtosis value of 1.677 indicated a normal distribution [40]" (Please see line 254-256 on page 10-11). References: Kim H-Y. Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. Restorative dentistry & endodontics. 2013;38(1):52-4. https://doi.org/10.5395/rde.2013.38.1.52 Point 12. The assumption of the homogeneity of variance for ANOVA also need to be reported Response 12: Thank you for your valuable comment and suggestion. We used the assumption of the homogeneity regarding previous references from Kim, 2013. "For sample sizes greater than 300, depend on the histograms and the absolute values of skewness and kurtosis without considering z-values. Either an absolute skewness value larger than 2 or an absolute kurtosis (proper) larger than 7 may be used as reference values for determining substantial non-normality" References: Kim H-Y. Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. Restorative dentistry & endodontics. 2013;38(1):52-4. https://doi.org/10.5395/rde.2013.38.1.52 Point 13. In Table 1 comparison between geographical region was done using one-way ANOVA since the sample size or not equal for western eastern and central regions therefore it is advised to use Kruskal Wallis test rather than one-way ANOVA Response 13: Thank you for your valuable comment and suggestion. In this revised manuscript, we added the normality test of distribution based on the reviewer's suggestion as follows; "Absolute values for skewness and kurtosis were used to assess normality of the data; skewness value of -0.264 and kurtosis value of 1.677 indicated a normal distribution [40]" (Please see line 254-256 on page 10-11). Thus, we use one-way ANOVA in Table 1 (comparison between geographical region). References: Kim H. Y. (2013). Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. Restorative dentistry & endodontics, 38(1), 52-54. https://doi.org/10.5395/rde.2013.38.1.52 Point 14. Since this study used and non-random sampling therefore the P value for interpretation of the results is not applicable therefore it is advised to discuss and interpret defining based on the effect size rather than P value Response 14: Thank you for your valuable comment and suggestion. We deleted the P value based on the reviewer's suggestion. We presented the adjusted beta coefficients () with 95% confidence intervals (CIs) to interpret defining based on the effect size rather than P value (Please see results section table 3 explanation; line 306 -309 on page 14). Point 15. In Table 2 and 3 comparing between disagree/ agree for each indicator was done, which is not required to do the comparison based on indicators. it is advised to concentrate on the overall score of a scale and its association with willingness and also acceptance Response 15: Thank you for your valuable comments and suggestions. In order to make manuscripts better presented, we reorganize data Tables 2 and 3 become Table 2 with the overall score of a scale. Tables 4 and 5 become Table 3. However, we presented all indicator's data in a supplementary file based on the reviewer's suggestion (Please see results sections; line 350-420on page 16-19). Point 16. Multiple linear regression analysis should be based on the total score of the components rather than including all indicators in the questionnaire as predictors therefore it is recommended to revise and redo the analysis for multiple linear regression based on the total score of all predictors in one model Response 16: Thank you for your valuable comments and suggestions. In order to

	make manuscripts better presented, we reorganize data and redo the analysis. Data in tables 4 and 5 become table 3 with the overall score of a scale. However, we presented all the indicator's data in a supplementary file based on the reviewer's suggestion Please see results section table 3 explanation; line 306 -309 on page 14). ----------thank you----------
Additional Information:	
Question	**Response**
Financial Disclosure Enter a financial disclosure statement that describes the sources of funding for the work included in this submission. Review the submission guidelines for detailed requirements. View published research articles from *PLOS ONE* for specific examples. This statement is required for submission and **will appear in the published article** if the submission is accepted. Please make sure it is accurate. **Unfunded studies** Enter: *The author(s) received no specific funding for this work.* **Funded studies** Enter a statement with the following details: • Initials of the authors who received each award • Grant numbers awarded to each author • The full name of each funder • URL of each funder website • Did the sponsors or funders play any role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript? • **NO** - Include this sentence at the end of your statement: *The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.* • **YES** - Specify the role(s) played. * typeset	The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.
Competing Interests Use the instructions below to enter a competing interest statement for this submission. On behalf of all authors, disclose any competing interests that could be perceived to bias this	The authors have declared that no competing interests exist.

work–acknowledging all financial support and any other relevant financial or non-financial competing interests. This statement is required for submission and **will appear in the published article** if the submission is accepted. Please make sure it is accurate and that any funding sources listed in your Funding Information later in the submission form are also declared in your Financial Disclosure statement. View published research articles from *PLOS ONE* for specific examples. **NO authors have competing interests** Enter: *The authors have declared that no competing interests exist.* **Authors with competing interests** Enter competing interest details beginning with this statement: *I have read the journal's policy and the authors of this manuscript have the following competing interests: [insert competing interests here]* * typeset	
Ethics Statement Enter an ethics statement for this submission. This statement is required if the study involved: • Human participants • Human specimens or tissue • Vertebrate animals or cephalopods • Vertebrate embryos or tissues • Field research Write "N/A" if the submission does not require an ethics statement.	This research was performed in accordance with the Helsinki Declaration guidelines and was written informed consent was obtained Ethics Committee of Institut Ilmu Kesehatan Strada Indonesia (reference no.: 2228/KEPK/XII/2020). Informed consent was granted from each respondent online who was assured of anonymity and confidentiality, their freedoms to withdraw from the study whenever and that the input information were collected for academic use only.

General guidance is provided below. Consult the submission guidelines for detailed instructions. **Make sure that all information entered here is included in the Methods section of the manuscript.** **Format for specific study types** **Human Subject Research (involving human participants and/or tissue)** • Give the name of the institutional review board or ethics committee that approved the study • Include the approval number and/or a statement indicating approval of this research • Indicate the form of consent obtained (written/oral) or the reason that consent was not obtained (e.g. the data were analyzed anonymously) **Animal Research (involving vertebrate animals, embryos or tissues)** • Provide the name of the Institutional Animal Care and Use Committee (IACUC) or other relevant ethics board that reviewed the study protocol, and indicate whether they approved this research or granted a formal waiver of ethical approval • Include an approval number if one was obtained • If the study involved *non-human primates*, add *additional details* about animal welfare and steps taken to ameliorate suffering • If anesthesia, euthanasia, or any kind of animal sacrifice is part of the study, include briefly which substances and/or methods were applied **Field Research** Include the following details if this study involves the collection of plant, animal, or other materials from a natural setting: • Field permit number • Name of the institution or relevant body that granted permission	
Data Availability Authors are required to make all data underlying the findings described fully	Yes - all data are fully available without restriction

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Describe where the data may be found in full sentences. If you are copying our sample text, replace any instances of XXX with the appropriate details. • If the data are **held or will be held in a public repository**, include URLs, accession numbers or DOIs. If this information will only be available after acceptance, indicate this by ticking the box below. For example: *All XXX files are available from the XXX database (accession number(s) XXX, XXX.*). • If the data are all contained **within the manuscript and/or Supporting Information files**, enter the following: *All relevant data are within the manuscript and its Supporting Information files.* • If neither of these applies but you are able to provide **details of access elsewhere**, with or without limitations, please do so. For example: *Data cannot be shared publicly because of [XXX]. Data are available from the XXX Institutional Data Access / Ethics*	The data presented in this study are available on request from the corresponding author and with permission of the Institutional Review Board of Institut Ilmu Kesehatan Strada Indonesia.

Committee (contact via XXX) for researchers who meet the criteria for access to confidential data. *The data underlying the results presented in the study are available from (include the name of the third party and contact information or URL).* • This text is appropriate if the data are owned by a third party and authors do not have permission to share the data. * typeset	
Additional data availability information:	Tick here if the URLs/accession numbers/DOIs will be available only after acceptance of the manuscript for publication so that we can ensure their inclusion before publication.

19 May, 2022

Dear,
Professor Emily Chenette
Editor-in-Chief *PLOS ONE*

Attached please find a manuscript entitled “Effects of spirituality, health engagement, health belief model, and attitude toward acceptance and willingness to pay COVID-19 vaccine”. Vaccine acceptance and willingness is fundamental to alleviate the spread of the virus. However, lack studies investigated the important wider determining factors including spirituality, health engagement (HE), attitude towards vaccine (AVs), and health belief model (HBM) toward acceptance and willingness to pay a vaccine COVID-19 in Indonesia. In this cross-sectional study, we estimated the effects of citizen’s spirituality, HE, VAs, and HBM construct [perceived susceptibility (PSU), severity (PSE), benefit, (PBE) and barrier (PBA)] toward intent to acceptance vaccinated and willingness to pay COVID-19 vaccine among general population in Indonesia using a large-scale multisite with online community-based study. We found that the results demonstrate the utility of spirituality, HE, AVs, and HBM construct in understanding intention to get vaccinated and willingness to pay a vaccine. These findings indicate crucial roles for health professional educators and practitioners in recognizing and implementing therapeutic approaches, such as improving spirituality, HE, AVs, and HBM construct toward intent to acceptance vaccinated and willingness to pay COVID-19 vaccine, which wider determinant. Consequently, the recollect with wider determinant factors, there are 41 references cited in this study. I will serve as the corresponding author. This manuscript is original and is not being considered for publication elsewhere. No conflict of interest exists with submission of this manuscript, and all authors approved the manuscript for publication. We deeply appreciate your consideration of our manuscript for publication The *PLOS ONE* and we look forward to receiving comments from the reviewers. If you have any queries, please do not hesitate to contact me at the address below. Thank you very much for your consideration.

Yours sincerely,

Corresponding author:
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July 30, 2022

Dear,
Professor Emily Chenette
Editor-in-Chief *PLOS ONE*

RE: [PONE-D-22-14548] - [EMID: ccb1e548dd430d0c]-Version 1

"Effects of spirituality, health engagement, health belief model, and attitude toward acceptance and willingness to pay COVID-19 vaccine"

Thank you for considering our manuscript and for the valuable suggestions, also the opportunity to resubmit a revised manuscript, which helps us to improve the article. We have carefully revised it in accordance with the reviewer's comments. In this revised version of the manuscript, we did our best to address all comments raised by the Reviewers. Specifically, we summarize the major changes: (i) This manuscript was edited by Taipei Medical University Academic Editing; (ii) We double check that our manuscript meets PLOS ONE's style requirements; (iii) We removed any funding- related text from our manuscript and update our finding statements in online submission;
(iv) We attach our data and data to be available with no restrictions doi//10.6084/m9.figshare.20400603; (v) The ethical statement only appear in the methods section; (vi) we improved the validity of the assessment tools; (vii) We trim and elaborate the introduction and discussion section; (viii) We reorganized the data collection procedures and process of translation questionnaires; (ix) We reorganize data table results with overall score of scale. The revised sections have been marked with red color in the revised manuscript. Our point-by-point responses to the comments are listed in the response letter. The revised manuscript has been revised to address the reviewer comments. We very much hope the revised manuscript is accepted for publication in PLOS ONE. Thank you very much for your consideration.

Yours sincerely,

Corresponding author:
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Effects of spirituality, health engagement, health belief and attitudes toward acceptance and willingness to pay fora COVID-19 vaccine

Running head: Acceptance and Willingness to Pay for a COVID-19 Vaccine

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Abstract

Purpose: To explore the wider determinant factor of citizens' spirituality, health engagement, health belief model, and attitudes towards vaccines toward acceptance and willingness to pay for a COVID-19 vaccination.

Methods: A community-based cross-sectional online investigation with convenience sampling was utilized to recruit 1423 citizens from 18 district across Indonesia between December 14, 2020 and January 17, 2021. Descriptive statistics, One-way analysis of variance, Independent t-tests, and multivariate linear regression were examined.

Results: Spirituality, all items of health engagement and attitude toward vaccine, as well as the items of health beliefs constructs (perceived susceptibility item-1, severity item-3, benefits item-1and item-3, barriers item 1, and item-3) were significant key factors of acceptance vaccine. Interestingly, the spirituality, attitude toward vaccine items-1, and items of health beliefs constructs including perceived susceptibility item-1, benefits item-2, barriers item-2, and item-3 indicated a significantly higher willingness.

Conclusions: Results demonstrated the utility of spirituality, HE, HBM construct, and AVs in understanding accept and willingness to pay a vaccine. Specifically, a key obstacle to the acceptance of and willingness to pay COVID-19 vaccination included a high score of the perceived barrier construct. Moreover, the acceptance of and willingness to pay could be impaired by worries about the side-effects of a COVID-19 vaccination.

Keywords: acceptance; health belief model; health engagement; spirituality; vaccine COVID-19.

Introduction

Up to now, coronavirus disease 2019 (COVID-19) has leads expand transmission across the world and has been confirmed as a worldwide pandemic and crisis situation health issue by the World Health Organization (WHO) [1]. Scientists discovered several new vaccines for COVID-19 were rapidly developed and distributed globally [2, 3]. Vaccine programs could substantially alleviate the spread of the virus, one of the problems for policymakers is determining how to motivate their citizens to get vaccinated. However, most vaccine sceptics refuse to be vaccinated [4]. Interestingly, Indonesia is unique because citizens typically have extremely spiritual beliefs, health attitude issues [5], and differences in health perspective [6], which may influence willingness to pay and acceptance a COVID-19 vaccine. Consequently, a better insight into of the typical determinatives of vaccine acceptance and general citizens' willingness to pay is critical to properly implementing strategies for large-scale vaccination programs [7]. Data gathered from this survey would provide scientific evidence for developing targeted programs to improve acceptance and willingness to pay vaccine and enhance vaccine management strategic decisions for current and future.

COVID-19 caused clusters of a complex respiratory syndrome characterized with a novel beta-coronaviruses infection [8]. As of May 31, 2021, the WHO confirmed that 170,051,718 individuals had been infected with COVID-19 worldwide [1]. Additionally, this disease has moved across Indonesia, where around 1,816,041 people are reported to be infected with 50.404 having died [9]. After scientists discovered this new SARS-CoV-2 strain, vaccines for COVID-19 were rapidly developed to be distributed globally [2, 3]. While vaccine programs could substantially alleviate the spread of the virus, one of the problems for policymakers is determining how to motivate their citizens to get vaccinated. Most vaccine skeptics refuse to be vaccinated [4].

Vaccine acceptance and willingness to pay reflect an actual understanding of implementing a vaccination and providing insight into the potential pricing decisions and demand forecasting among the citizenry. Therefore, it is fundamental for successful vaccination programs in order to achieve high immunization coverage rates, notably for a recently arising irresistible pandemic as we are currently experiencing [7]. Recent studies shown that the acceptance of vaccination COVID-19 in US [10], Russia [11], Malaysia [7], and Jordan [12] were 67%, 55%, 48.2%, and 37.4%, respectively. However, a global survey showed that differences in acceptance of a vaccination ranged more than 70% among citizens in 19 countries [11]. Interestingly, the majority of the population in Malaysia [7], Chile [13], Ecuador [14], and the US [15] indicated willingness to pay for a vaccination. Reports on Indonesian citizens' vaccine acceptance showed satisfactory results at 93.3% [16] and almost 78.3% were willingness to pay a vaccination COVID-19 [17]. Nevertheless, two studies investigated the willingness to pay [17] and acceptance [16] for a vaccination in Indonesia, and they were only concerned with socioeconomics, pre-existing susceptibility to COVID-19-related facts, and risk perception variables. In fact, the understanding of acceptance and willingness to pay was a crucial factor for public health policymakers. Formulating strategies program of vaccination COVID-19 might reduce concerns about the expedited vaccine development [7, 18]. Hence, examining determining factors of acceptance of and willing to pay a vaccination is major to the successful immunization coverage rates in ordinary Indonesians.

Spirituality as a therapeutic approach for healthcare systems plays a critical role in encouraging healthy behaviors using the power of faith and beliefs [19] and is an adaptation in response to the transmission dynamics of COVID-19 [5, 20]. Ancient wisdom from spiritual fields can be very useful in encouraging citizens to survive the threat of the COVID-19 pandemic [21]. Indonesia is unique because citizens typically have strong positive

spirituality linked to health behaviors and health beliefs [5, 22]. Whereas studies of spirituality have seldom been linked to adaptive response, research on spirituality and medical status has been largely but not exclusively focused [5, 20, 21] on willingness to pay and acceptance a COVID-19 vaccine. Consequently, investigating spirituality might a beneficial valuable approach to promote new insights into implementing vaccination programs.

Among other factors accounting for changes in citizens' health related-behaviors, researchers recently showed the value of health engagement (HE) in affecting health policymaking and serving as a major indicator of personal attitudes [23-25]. HE is characterized as private proactivity in the administration of wellbeing related concerns [26]. Only one study explored if HE might increase vaccination coverage toward COVID-19 and if it is a reliable indicator of individuals sustaining and enhancing their vaccine attitudes (AVs). Moreover, AVs were strongly correlated with acceptance of vaccines [26]. This means that citizens' HE is crucial in playing an active role in an individual's psychological readiness to accept a vaccine as an aspect of a healthcare climate-related policy. Indonesia has been prone to severe instability recently due to this pandemic [5]; relationships among HE, and AVs toward acceptance, and willingness to pay for an immunization should be clearly investigated.

The theory of health belief model (HBM) is a worth hope theory that analyzes the longing to keep away from illness and the conviction that specific wellbeing related activities could assist with forestalling it [27, 28]. The HBM comprises perceived barriers, benefits, susceptibility, and severity applied extensively to behaviors and is most commonly used to predict and justify health-related behaviors [27, 28]. Empirical studies of the HBM showed significant associations of intentions to accept and willingness get a vaccine [18, 29]. Other research from Malaysia proved that citizens who believed in the perceived benefits of a

vaccination had a positively stronger 2.51-fold risk of acceptance, and the higher score of perceived severity was correlated with a higher level of willing to pay a vaccine [7]. As HBM constructs are also considerably correlated with a willing to pay, HBM model can be used to assess implementation of strategies to encourage vaccinations against the pandemic as a requirement for expenditures [7, 18]. Immunization campaigns are indeed considered effective when vaccination programs have a significantly high rate of vaccine acceptance [7, 10] and a willingness to pay for it [7]. To accomplish this, it is necessary to understand Indonesian citizens' health behaviors. Their HE and general VAs affect their acceptance of and willingness to be vaccinated against COVID-19. Present investigation intended to identify how health behaviors, i.e., HE, AVs, and HBM constructs, affect citizens' intentions to a willingness to pay and accepted a COVID-19 vaccination. Also, we assessed the positive association of spirituality in contributing to the intentions to accept and the willingness to pay for a COVID-19 vaccination in Indonesia.

Methods

Design and participants

Present examination was a cross-sectional internet-based overview in the time of COVID-19 for 18 provinces in Indonesia. The final information was gathered utilizing convenience sampling via a Google Form shared in Telegram, WhatsApp, Instagram and Facebook, the most accessible online media networks used by Indonesian citizens. Sampling relied on using research researchers' technological and personal networks, further participation in and contributions to the data collection by community leaders. The eligible target population was Indonesian citizens aged 17 until 65 years, who understood Bahasa Indonesia and filled the consent form. Citizens who had previously been confirmed with suspected COVID-19 was excluded. The total sample size consisted of 1,423 Indonesian citizens.

Data collation procedure

The investigation was collected between December 15, 2020 to January 12, 2021. Our survey comprised four sections. The online survey's first section notified potential participants who were Indonesian citizens of the survey's intent, which was to investigate their acceptance of and willingness to be vaccinated. Informed consent was taken by checking the box "Agree", which was required to confirm that they understood the authorization information and met the inclusion and exclusion criteria. Additionally, participants decided to participate voluntarily and with the freedom to withdraw at any time. Second section comprised eight items questions correlated to sociodemographic. Third section comprised one question that assessed the intention to accept being vaccinated and willingness to pay for vaccinated. Fourth section contained 35 question based on four themes: HE, AVs, health belief perceptions, and spirituality. Finally, a page at the end expressed our gratitude, and all citizens who participated by completing the survey were encouraged to persuade other people to participate from their contact lists by forwarding the link of the online survey.

Measurements

The measurements were indeed based on previous research that appeared into determining factors for willingness to pay and vaccine acceptance [7, 16, 17, 26, 30]. There were factors including the intention to accept and willingness to pay a vaccine, HBM, HE, AVs, spirituality and the sociodemographic questionnaire including age, income, gender, educational level, geographical region, marital status, urbanicity, and the pandemic's impact on their income.

The questionnaire was translated from English to Indonesian version, including citizens' HE, AVs, HBM, spirituality, acceptance get vaccinated, and willingness to pay for a vaccine. These questionnaires were validated by a process of face and content validity to

assess their acceptability and readability by five selected experts before actually pretesting among general citizens. Refinements were made based on the feedback received to enable easy understanding of the questions. Importantly, prior to completing the formal online survey, we conducted a pilot study with 60 residents in the close surroundings of the researchers to determine the questionnaire's readability and reliability.

Intention to accept and willingness to pay a vaccine were evaluated using a two-item question: “Do you intend to accept vaccination for COVID-19?” and “Are you willing to pay US$17.70~35.40 for a vaccination COVID-19?”. These questions were provided as continuous data of vaccine acceptance and willingness to pay on five-point Likert scale; 1 to 5 (not likely at all to absolutely). This instrument was adapted from previous studies [17, 26]. A higher score indicated a more-favorable attitude to acceptance and willing a vaccination.

The Daily Spiritual Experiences Scale (DSES) contains sixteen questions regarding their spirituality on a 6-point Likert scale; 1 = at no time to 6 = many times a day [31]. The greater the number of experiences points a person has, the greater their spirituality. The Indonesian translation version of the DSES questionnaire-spirituality had Cronbach’s alpha of 0.88 [5]. In present study, the Cronbach's alpha value for spirituality was 0.70 that indicating acceptable reliability.

Health engagement consists of six questions, each with a 5-point Likert scale ranging from 1 to 5, with 1 being strongly disagree and 5 being strongly agree. Notably, greater value a person has, indicating greater their HE [26]. We defined HE scores as categorical data for disagreement (neither agree nor disagree/ disagree/ strongly disagree) and agreement (agree/strongly agree). For the present study, HE questionnaire English was translated into Indonesian and had a content validity index (CVI) of 0.93 and a Cronbach's alpha of 0.91, indicating acceptable validity and reliability.

HBM probed perceived benefits (PBE), susceptibility (PSU), barriers (PBA), and severity (PSE) and has a 7-point Likert-scale; 1 = strongly disagree to 7 = strongly agree [30]. Also, HBM was used in COVID-19 vaccinations research [7, 18]. A higher score indicates a good health belief, except for the PBA domain. In the present study, the HBM constructs score involve the agreement (somewhat agree/agree/strongly agree), and disagreement (somewhat disagree/disagree/ strongly disagree /neither agree nor disagree). for the HBM Indonesian version, the CVI was 0.95 and Cronbach's alpha 0.86, 0.80, 0.77, 0.60, and 0.81 was acceptable for PSU, PSE, PBE, and PBA, respectively.

AVs uses a 5-point Likert scale, with 1 being strongly disagree and 5 being strongly agree. The questions as follows; (1) "COVID-19 vaccination could have serious collateral effects on my own health"; and (2) "I am sure of the vaccine's effectiveness in preventing infectious diseases such as COVID-19" [26]. For our study analysis, we defined VAs scores involve the agreement (strongly agree/agree), and disagreement (neither agree nor disagree, strongly disagree/disagree). The Indonesian version of the VAs questionnaire had acceptable CVI 0.95 and Cronbach's α of 0.70 in our study.

Data analysis

Descriptive analyses statistic were utilized to evaluate demographic, HE, AVs, health beliefs, and spirituality between groups. The findings are reported as percentages (%) and frequencies (n). The mean and standard deviation (SD) of continuous variables were calculated using an independent t-test or one-way analysis of variance (ANOVA). The variance inflation factor (VIF) of 10 was used to calculate multicollinearity [32]. This study had a maximum VIF of 5.81 for vaccination acceptance and 5.92 for willingness to pay a vaccine, s demonstrates that the results had a low level of multicollinearity. Multiple linear regression was used to obtain adjusted beta coefficients (β) with 95% confidence intervals (CIs) for willingness to pay and acceptance a vaccine, and were correlated to exposures of interest (HE, AVs, health beliefs,

and spirituality) after adjusted for potential covariate factors. For all statistical analyses, SPSS Vers. 25 IBM (Armonk, NY, USA) was utilized, and statistical significance was defined as $p<0.05$.

Results

Table 1 presented that there were significant differences by geographical region in vaccine acceptance and willingness to pay for the vaccine. However, we found no significant difference in marital status or education level of vaccine acceptance and willingness to pay. Willingness to pay for the vaccine also significantly differed by gender, age, income, urbanicity, and the pandemic's impact on their income, but not in vaccine acceptance among Indonesian citizens (Table 1).

Table 1. Relationships of Distributions of Demographic and Determinant Factors with Acceptance of and Willingness to Pay for COVID-19 Vaccine (*n*=1423)

Variable	All participants (*n*=1423) *n* (%)	Acceptance		Willingness to pay	
		Mean (SD)	*p* value	Mean (SD)	*p* value
Gender [a]					
Men	602 (42.3)	3.85 (1.08)	.332	2.69 (1.28)	.006
Women	821 (57.7)	3.90 (0.92)		2.51 (1.09)	
Age (years) [b]					
17~24	640 (45.0)	3.84 (1.01)	.216	2.50 (1.13)	.047
25~39	550 (38.7)	3.94 (0.93)		2.66 (1.21)	
>40	233 (16.4)	3.88 (1.09)		2.64 (1.20)	
Marital status [a]					
Not married	861 (60.5)	3.90 (0.97)	.380	2.57 (1.17)	.598
Married	562 (39.5)	3.85 (1.02)		2.60 (1.19)	
Education [a]					
ISCED <3	51 (3.6)	3.84 (0.90)	.772	2.29 (1.10)	.072
ISCED ≥3	1372 (96.4)	3.88 (0.99)		2.60 (1.18)	
Income (IDR) [b]					
<2.5 million	782 (55.0)	3.89 (0.98)	.585	2.46 (1.13)	<.001
2.5~5 million	432 (30.4)	3.88 (0.95)		2.72 (1.15)	

Variable	All participants (*n*=1423) *n* (%)	Acceptance		Willingness to pay	
		Mean (SD)	*p* value	Mean (SD)	*p* value
6~10 million	166 (11.7)	3.82 (1.09)		2.63 (1.21)	
>10 million	43 (3.0)	4.05 (1.21)		3.30 (1.64)	
Geographical region [b]					
Western region	1013 (71.2)	3.87 (0.97)	.013	2.48 (1.12)	<.001
Eastern region	169 (11.9)	4.08 (1.01)		1.28 (0.10)	
Central region	241 (16.9)	3.80 (1.04)		1.24 (0.08)	
Urbanicity [a]					
Rural	635 (44.6)	3.91 (0.95)	.404	2.51 (1.17)	.028
Urban	788 (55.4)	3.86 (1.02)		2.65 (1.18)	
Pandemic's impact on income [a]					
No impact	733 (51.5)	3.88 (0.99)	.831	2.74 (1.19)	<.001
With an impact	690 (48.5)	3.89 (0.99)		2.42 (1.14)	

Data are presented as the mean ± standard deviation (SD), or frequency and percentage. COVID-19 = coronavirus disease 2019, ISCED = international standard classification of education; IDR = Indonesian rupiah. [a] an independent *t*-test or*;* [b] a one-way ANOVA. $p<0.05$ indicates statistical significance * $p<.05$; ** $p<.001$.

We presented specific spirituality, HE and AVs variable for vaccine acceptance and willingness to pay for the vaccine. We observed that the means (SD) of vaccine acceptance and willingness to pay were significantly higher for citizens who agreed with all statements of HE, and AVs. Moreover, a higher score of acceptance was identified in citizens with a higher spirituality score of ≥72 ($p<0.001$), but a willingness to pay was not significant (Table 2).

Table 2. Comparisons of Citizen's Spirituality, Health Engagement, and Attitudes with Their Acceptance and Willingness to Pay for the COVID-19 Vaccine (*n*=1423)

Variables	All participants (*n*=1423) *n* (%)	Acceptance		Willingness to pay	
		Mean (SD)	*p* value	Mean (SD)	*p* value
Spirituality					
Low (score <72)	741 (52.1)	3.68 (1.03)	<.001	2.64 (1.18)	.066
High (score ≥72)	682 (47.9)	4.10 (0.90)		2.52 (1.17)	
Health engagement (HE)					

Variables	All participants (*n*=1423) *n* (%)	Acceptance		Willingness to pay	
		Mean (SD)	*p* value	Mean (SD)	*p* value
I can manage my own health effectively. (HE1)					
Disagree	421 (29.6)	3.00 (1.06)	<.001	2.26 (1.09)	<.001
Agree	1002 (70.4)	4.25 (0.68)		2.72 (1.18)	
I spend a lot of time informing myself about health. (HE2)					
Disagree	515 (36.2)	3.17 (1.10)	<.001	2.26 (1.07)	<.001
Agree	908 (63.8)	4.29 (0.64)		2.77 (1.19)	
I can manage my own health even under stress. (HE3)					
Disagree	433 (30.4)	3.01 (1.07)	<.001	2.27 (1.09)	<.001
Agree	990 (69.6)	4.27 (0.65)		2.72 (1.18)	
I usually share concerns about my own health with my general practitioner. (HE4)					
Disagree	468 (32.9)	3.07 (1.07)	<.001	2.22 (1.03)	<.001
Agree	955 (67.1)	4.28 (0.65)		2.77 (1.20)	
I usually tell my general practitioner about unusual symptoms. (HE5)					
Disagree	485 (34.1)	3.11 (1.07)	<.001	2.23 (1.06)	<.001
Agree	938 (65.9)	4.28 (0.65)		2.77 (1.19)	
It is important to cooperate with healthcare workers in defining how to manage my own health. (H6)					
Disagree	358 (25.2)	2.82 (1.04)	<.001	2.20 (1.05)	<.001
Agree	1065 (74.8)	4.24 (0.67)		2.72 (1.19)	
Attitudes towards vaccines (AVs) A vaccination could have serious collateral effects on my own health. (AVs1)					
Disagree	777 (54.6)	3.49 (1.07)	<.001	2.42 (1.13)	<.001
Agree	646 (45.4)	4.35 (0.61)		2.78 (1.21)	

Variables	All participants (*n*=1423) *n* (%)	Acceptance		Willingness to pay	
		Mean (SD)	*p* value	Mean (SD)	*p* value
I am sure of vaccines' effectiveness in preventing infectious diseases. (AV2s)					
Disagree	525 (36.9)	3.11 (1.02)	<.001	2.18 (1.05)	<.001
Agree	898 (63.1)	4.33 (0.64)		2.82 (1.18)	

Data are presented as the mean ± standard deviation (SD), frequency, and percentage. COVID-19 = coronavirus disease 2019; AVs = attitude towards vaccines; HE = health engagement. *p* values were calculated using an independent *t*-test; $p<.05$ indicates statistical significance.

Also, we observed that the means (SD) of vaccine acceptance and willingness to pay were significantly higher for citizens who agreed with health beliefs constructs (PSU, PSE, and PBE). In analyzing citizens' PBA, those who reported disagreeing with the statements "the side-effects of vaccination interfere with my usual activities" (PBA1), "I am scared of needles" (PBA2), and "I cannot be bothered to get a vaccination" (PBA3) were positively associated with high vaccine acceptance scores (all $p<0.001$) but were not correlated with a willingness to pay, except for PBA3 (Table 3).

Table 3. Comparisons of Citizen's Health Beliefs with Their Acceptance and Willingness to Pay for COVID-19 Vaccine (*n*=1423)

Variables	All participants (*n*=1423) *n* (%)	Acceptance		Willingness to pay	
		Mean (SD)	*p* value	Mean (SD)	*p* value
Health beliefs – Perceived susceptibility (PSU) My chance of getting COVID-19 in the next few months is great. (PSU1)					
Disagree	696 (48.9)	3.60 (1.08)	<.001	2.32 (1.09)	<.001
Agree	726 (51.1)	4.16 (0.81)		2.84 (1.20)	
I am worried about the likelihood of getting COVID-19 in the future. (PSU2)					

Variables	All participants (*n*=1423) *n* (%)	Acceptance		Willingness to pay	
		Mean (SD)	*p* value	Mean (SD)	*p* value
Disagree	632 (44.4)	3.56 (1.11)	<.001	2.36 (1.13)	<.001
Agree	791 (55.6)	4.14 (0.80)		2.76 (1.18)	
Getting COVID-19 is currently a possibility for me. (PSU3)					
Disagree	555 (39.0)	3.51 (1.13)	<.001	2.35 (1.13)	<.001
Agree	868 (61.0)	4.12 (0.81)		2.74 (1.18)	
Health beliefs – Perceived severity (PSE) Complications from COVID-19 are serious. (PSE1)					
Disagree	694 (48.8)	3.66 (1.08)	<.001	2.41 (1.13)	<.001
Agree	729 (51.2)	4.09 (0.84)		2.75 (1.19)	
I will be very sick if I get COVID-19. (PSE2)					
Disagree	635 (44.6)	3.60 (1.11)	<.001	2.39 (1.15)	<.001
Agree	788 (55.4)	4.11 (0.82)		2.74 (1.17)	
I am afraid of getting COVID-19. (PSE3)					
Disagree	592 (41.6)	3.51 (1.13)	<.001	2.35 (1.13)	<.001
Agree	831 (58.4)	4.12 (0.81)		2.74 (1.18)	
Health beliefs – Perceived benefits (PBE) Vaccination is a good idea because I feel less worried about catching COVID-19. (PBE1)					
Disagree	579 (40.7)	3.51 (1.06)	<.001	2.24 (1.07)	<.001
Agree	844 (59.3)	4.14 (0.85)		2.82 (1.19)	
Vaccination decreases my chances of getting COVID-19 and its complications. (PBE2)					
Disagree	573 (40.3)	3.52 (1.05)	<.001	2.22 (1.03)	<.001
Agree	850 (59.7)	4.13 (0.87)		2.83 (1.20)	
If I get vaccinated, I will decrease the frequency of having to consult my doctor. (PBE3)					
Disagree	1062 (74.6)	3.80 (1.00)	<.001	2.48 (1.12)	<.001

Variables	All participants	Acceptance		Willingness to pay	
	(*n*=1423) *n* (%)	Mean (SD)	*p* value	Mean (SD)	*p* value
Agree	361 (25.4)	4.13 (0.92)		2.89 (1.28)	
Health beliefs – Perceived barriers (PBA) The side-effects of vaccination may interfere with my usual activities. (PBA1)					
Disagree	1160 (81.5)	3.97 (0.90)	<.001	2.58 (1.13)	.949
Agree	263 (18.5)	3.48 (1.26)		2.59 (1.35)	
I am scared of needles. (PBA2)					
Disagree	1146 (80.5)	4.00 (0.90)	<.001	2.58 (1.14)	.957
Agree	277 (19.5)	3.40 (1.20)		2.59 (1.32)	
I cannot be bothered to get a vaccination. (PBA3)					
Disagree	952 (66.9)	3.98 (0.90)	<.001	2.71 (1.11)	<.001
Agree	471 (33.1)	3.68 (1.13)		2.34 (1.26)	

Data are presented as the mean ± standard deviation (SD), frequency, and percentage. COVID-19 = coronavirus disease 2019; PBA = perceived barriers; PBE = perceived benefits; PSE = perceived severity; PSU = perceived susceptibility. *p* values were calculated using an independent *t*-test; $p<0.05$ indicates statistical significance.

Table 4 summarize the findings of the multiple linear regression performed of spirituality, HE, health beliefs, and AVs for vaccine acceptance and willingness to pay. Further statistical test showed that getting high spirituality was connected with a higher vaccine acceptance value (β = 0.14, 95% CI = 0.07~0.21), and was significantly associated with a willingness to pay (β = -0.25, 95% CI = -0.37~-0.14) among Indonesian citizens. Both all items of HE and AVs were the strongest determining factors of the vaccine acceptance score. However, HE items 1 to 5 and AVs1 were not correlated with a willingness to pay after adjusting for confounding variables (Table 4)

Table 4. Adjusted Beta-Coefficients and 95% Confidence Intervals (CIs) of Spirituality, Health Engagement, and Attitude Toward Vaccine with Participants' Acceptance and Willingness to Pay for COVID-19 Vaccine (*n*=1423)

Variable	Acceptance		Willingness to pay	
	Unadjusted coef. β (95% CI)	**Adjusted coef. β (95% CI)[a]**	**Unadjusted coef. β (95% CI)**	**Adjusted coef. β (95% CI)[b]**
Spirituality				
Low (score <72)	Ref.	Ref.	Ref.	Ref.
High (score ≥72)	0.43 (0.33~0.53)**	0.14 (0.07~0.21)**	-0.11 (-0.24~0.01)	-0.25 (-0.37~-0.14)**
Health engagement (HE) I can manage my own health effectively. (HE1)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	1.25 (1.16~1.34)**	0.20 (0.09~0.31)**	0.46 (0.33~0.59)**	-0.01 (-0.18~0.18)
I spend a lot of time informing myself about health. (HE2)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	1.11 (1.02~1.20)**	0.13 (0.03~0.23)**	0.50 (0.38~0.63)**	0.12 (-0.04~0.28)
I can manage my own health even under stress. (HE3)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	1.26 (1.17~1.35)**	0.25 (0.14~0.35)**	0.46 (0.33~0.59)**	0.05 (-0.13~0.23)
I usually share concerns about my own health with my general practitioner. (HE4)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	1.20 (1.11~1.29)**	0.21 (0.10~0.31)**	0.55 (0.42~0.68)**	0.16 (-0.01~0.34)
I usually tell my general practitioner about unusual symptoms. (HE5)				
Disagree	Ref.	Ref.	Ref.	Ref.

Variable	Acceptance		Willingness to pay	
	Unadjusted coef. β (95% CI)	**Adjusted coef. β (95% CI)[a]**	**Unadjusted coef. β (95% CI)**	**Adjusted coef. β (95% CI)[b]**
Agree	1.17 (1.01~1.26)**	0.11 (0.01~0.23)*	0.53 (0.41~0.66)**	0.13 (-0.05~0.30)
It is important to cooperate with healthcare workers in defining how to manage my own health. (H6)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	1.41 (1.32~1.51)**	0.28 (0.16~0.40)**	0.52 (0.38~0.66)**	-0.06 (-0.27~0.14)
Attitudes towards vaccines (AVs) A vaccination could have serious collateral effects on my own health. (AVs1)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	0.86 (0.77~0.96)**	0.29 (0.21~0.36)**	0.35 (0.23~0.47)**	0.04 (-0.09~0.17)
I am sure of vaccines' effectiveness in preventing infectious diseases. (AVs2)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	1.22 (1.14~1.31)**	0.31 (0.21~0.41)**	0.64 (0.52~0.76)**	0.17 (0.01~0.33)*

β = beta; COVID-19 = coronavirus disease 2019; CIs = confidence intervals; AVs = attitude towards vaccines; HE = health engagement. Adjusted beta-coefficients (coef.) and 95% CIs were estimated using a multiple linear regression after adjusting for [a] geographical region or [b] gender, age, income, geographical region, urbanicity, pandemic impact on income. * $p<.05$; ** $p<.001$.

Table 5 revealed that the six items of health beliefs constructs (PSU1, PSE3, PBE1, PBE3, PBA1, and PBA3) were the strongest determining factors of the vaccine acceptance,

while other items of health beliefs (PSU2, PSU2, PSE1, PSE2, PBE2, and PBA2) were not significant predictors of the vaccine acceptance score after adjusting for confounding variables. Citizens who justified (chose 'agree') all items of HE and AV1 had no significant correlation with the willingness to pay score compared to those who responded with 'disagree' by adjustment for possible confounding factors. Citizens who agreed with the statement PSU1, PBE2, and PBA2 had significantly higher scores for willingness to pay, and they were sure of the vaccine's effectiveness in preventing infectious diseases (AVs2) (β = 0.47, 95% CI = 0.25~0.68; β = 0.24, 95% CI = 0.05~0.42; β = 0.17, 95% CI = 0.01~0.34, and β = 0.17, 95% CI = 0.01~0.33, respectively). Moreover, citizens who also agreed with the statement that they could not be bothered to get a vaccination (PBA3) had significantly lower scores for willingness to pay (β = -0.44, 95% CI = -0.57~-0.32; Table 5).

Table 5. Adjusted Beta-coefficients and 95% Confidence Intervals (CIs) of Health Beliefs Constructs with Participants' Acceptance and Willingness to Pay for COVID-19 Vaccine (*n*=1423)

Variable	Acceptance		Willingness to pay	
	Unadjusted coef. β (95% CI)	**Adjusted coef. β (95% CI)[a]**	**Unadjusted coef. β (95% CI)**	**Adjusted coef. β (95% CI)[b]**
Health beliefs – Perceived susceptibility (PSU) My chance of getting COVID-19 in the next few months is great. (PSU1)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	0.56 (0.46~0.66)**	0.19 (0.06~0.32)**	0.52 (0.40~0.64)**	0.47 (0.25~0.68)**
I am worried about the likelihood of getting COVID-19 in the future. (PSU2)				
Disagree	Ref.	Ref.	Ref.	Ref.

Variable	Acceptance		Willingness to pay	
	Unadjusted coef. β (95% CI)	**Adjusted coef. β (95% CI)[a]**	**Unadjusted coef. β (95% CI)**	**Adjusted coef. β (95% CI)[b]**
Agree	0.58 (0.48~0.67)**	0.05 (-0.10~0.19)	0.40 (0.28~0.52)**	0.01 (-0.24~0.24)
Getting COVID-19 is currently a possibility for me. (PSU3)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	0.61 (0.50~0.71)**	-0.16 (-0.32~0.01)	0.39 (0.27~0.52)**	-0.02 (-0.29~0.25)
Health beliefs – Perceived severity (PSE) Complications from COVID-19 are serious. (PSE1)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	0.43 (0.33~0.53)**	-0.08 (-0.20~0.04)	0.35 (0.23~0.47)**	-0.18 (-0.38~0.02)
I will be very sick if I get COVID-19. (PSE2)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	0.52 (0.42~0.62)**	-0.02 (-0.15~0.11)	0.35 (0.23~0.48)**	0.09 (-0.13~0.30)
I am afraid of getting COVID-19. (PSE3)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	0.58 (0.48~0.68)**	0.23 (0.08~0.38)**	0.31 (0.18~0.43)**	-0.07 (-0.32~0.18)
Health beliefs – Perceived benefits (PBE) Vaccination is a good idea because I feel less worried about catching COVID-19. (PBE1)				
Disagree	Ref.	Ref.	Ref.	Ref.

Variable	Acceptance		Willingness to pay	
	Unadjusted coef. β (95% CI)	**Adjusted coef. β (95% CI)[a]**	**Unadjusted coef. β (95% CI)**	**Adjusted coef. β (95% CI)[b]**
Agree	0.64 (0.54~0.74)**	0.18 (0.07~0.28)**	0.58 (0.45~0.70)**	0.16 (-0.02~0.34)
Vaccination decreases my chance of getting COVID-19 or its complications. (PBE2)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	0.61 (0.51~0.71)**	0.03 (-0.09~0.14)	0.62 (0.50~0.74)**	0.24 (0.05~0.42)*
If I get vaccinated, I will decrease the frequency of having to consult my doctor. (PBE3)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	0.33 (0.21~0.45)**	0.10 (0.01~0.18)*	0.41 (0.27~0.55)**	0.13 (-0.01~0.27)
Health beliefs – Perceived barriers (PBA) The side-effects of vaccination may interfere with my usual activities. (PBA1)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	-0.49 (-0.62~-0.36)**	-0.29 (-0.39~-0.19)**	0.01 (-0.15~0.16)	-0.05 (-0.21~0.11)
I am scared of needles. (PBA2)				
Disagree	Ref.	Ref.	Ref.	Ref.
Agree	-0.59 (-0.72~-0.47)**	-0.06 (-0.16~0.04)	0.05 (-0.15~0.16)	0.17 (0.01~0.34)*
I cannot be bothered to get a vaccination. (PBA3)				
Disagree	Ref.	Ref.	Ref.	Ref.

Variable	Acceptance		Willingness to pay	
	Unadjusted coef. β (95% CI)	**Adjusted coef. β (95% CI)[a]**	**Unadjusted coef. β (95% CI)**	**Adjusted coef. β (95% CI)[b]**
Agree	-0.30 (-0.41~-0.19)**	-0.19 (-0.26~-0.11)**	-0.37 (-0.50~-0.24)**	-0.44 (-0.57~-0.32)**

β = beta; CIs = confidence intervals; COVID-19 = coronavirus disease 2019; PBA = perceived barriers; PBE = perceived benefits; PSE = perceived severity; PSU = perceived susceptibility. Adjusted beta-coefficients (coef.) and 95% CIs were estimated using a multiple linear regression after adjusting for [a] geographical region or [b] gender, age, income, geographical region, urbanicity, pandemic impact on income. * $p<.05$; ** $p<.001$.

Discussion

The current findings are the first study to gather essential determinant factors involving spirituality, HE, AVs, and health beliefs in a cross-sectional and multi-center research of general citizens with varied relationships of vaccine acceptance and willingness to pay for a COVID-19 vaccine. Moreover, our findings had a high response rate based on the multisite study, and an expert panel validated all survey instruments. Furthermore, a large community-based study could integrate information about individual effects of HE, the HBM, AVs and spirituality on and willingness to pay and vaccine acceptance by citizens that could encourage potential research being applied in community and clinical settings. Particularly, this research revealed that citizens who agreed with the positive HE and AVs, and had higher spirituality were statistically related with higher score of vaccine acceptance, but those were not significantly correlated with a willingness to pay for a vaccine among Indonesian population. Notably, an unexpected finding revealed that several HBM constructs (PSU2, PSU3, PSE1, PSE2, PBE2, and PBA2) were not significantly related with vaccine acceptance after adjustment for possible confounding factors.

Remarkably, the occurrence of challenges escalated by the COVID-19 disease outbreak demonstrates the magnitude of spirituality [5], but spirituality's effects on acceptance and

willingness to pay for a vaccine have not exclusively been explored or investigated. Similarly, Thomas et al.'s study reported that spirituality was strongly associated with parents' perceptions of their influence over and ways of dealing with health problems potentially related to the human papillomavirus vaccination [33]. Indonesia has a diverse culture and extremely unique spiritual belief. This rare situation requires a holistic care of nursing including spiritual needs and how those needs are related to health behaviors and health beliefs [5, 22]. Conceivably, spirituality encourages acceptance-based responses, specifically, adaptive responses involving (a) being aware of and accepting of one's own emotional experiences, (b) learning a variety of coping mechanisms so that one can respond flexibly and interactively to emotional experiences while remaining committed to achieving recovery-related priorities, (c) implementing adaptive mechanisms as these states appear, and showing great outcomes as a result of those actions [34]. Our current findings indicated that spirituality might be strongly correlated with a willing to pay and vaccine acceptance. Consequently, well-designed strategies to prevent or grow spirituality may even be important to increase the desire to be vaccinated.

It was found that HE was significantly related with acceptance vaccination, and it was a good predictor of individuals maintaining and improving a good attitude toward the vaccine [26]. Notably, those findings aligned with our results where HE and AVs indicated higher vaccine acceptance. A similar study, suggested that a comprehensive understanding of student' viewpoints on supporting their HE and consciousness may enable planning of effective responses and multidisciplinary educational strategies, including underlying AVs that influence perspectives about acceptance of the vaccine [35]. Therefore, these data suggested that the HE and AVs are predictive of COVID-19 vaccination acceptance. Currently, no studies have explored relationships between HE and a willing to pay for a vaccination. Of note, HE was a critical predictor of preventive behaviors [36]. In our present

findings, positive AVs1 was not correlated with a willingness to pay a vaccine, but AVs2 was related with a willing to pay a vaccine.

One of the strongest correlates of vaccine acceptance and willing to pay vaccine was whether participants thought that they had a good opportunity of obtaining COVID-19 in the following months. Notably, our results were aligned with a previous study in terms of identifying that the HBM-perceived susceptibility was related to willing to pay and vaccine acceptance [7]. Therefore, investigators suggested that those with high perceived susceptibility were also correlated with positive HE in promoting behaviors in Germany and Australia [37]. In particular, our findings also evaluated the perceived severity, but only one question was related to being afraid of getting COVID-19, and it was significantly associated with a high vaccine acceptance score but not significantly with a willingness to pay for the vaccination. Similar HBM outcomes, specifically perceived severity, were identified in a Malaysian population. Additionally, they shown that the public strong reliance of the HBM-perceived severity was correlated with a willing to pay a vaccine, but it was not positively correlated with vaccine acceptance [7]. However, a community large study of 1200 citizens in Hong Kong revealed that the perceived severity had 1.16-fold higher score of vaccine acceptance after adjusting for covariates [38]. These conflicting results may be attributable to monthly income [7] and low levels of knowledge about vaccine programs [16].

In our data, high-scores on PBE, i.e., PBE1 and PBE3," were strongly determinants of vaccine acceptance after adjusting for covariates. Nevertheless, citizens with high scores on PBE of the immunization could decline their chances of getting COVID-19. This survey indicated that in terms of benefits, citizens who intended to receive the vaccine saw extraordinarily strong PBE in getting the vaccination to ensure their own and others' safety, linier to what Shmueli et al. suggested that vaccination enforcement relies on personal risk-benefit perceptions [29]. Similar to our study, a cross-sectional study in Kenya revealed that

perceptions of vaccine benefits were associated with a willing to pay for a Peste des Pettis Ruminants vaccine [39]. Citizens with health beliefs about side-effects of the vaccine interfering with their daily activities and those who could not be bothered to get an immunization were correlated with vaccine acceptance, but only one item of PBA “cannot be bothered to get an immunization” was correlated with willingness to pay. The present study aligned with previous investigations which suggested that citizens with a lower score for worrying about possible side-effects of the vaccination had a 1.81-fold lower score for vaccine acceptance, and no significant correlation with a willingness to pay for a COVID-19 vaccination [7]. Moreover, a high score on the PBA of "cannot be bothered to get the vaccine" was a significant predictor of a lower vaccine acceptance scores among 799 general citizens in the US [18]. The increase in COVID-19-related skepticism of vaccine acceptance and the low rate of willingness to pay for a vaccine among Indonesian residents require further priority advocacy of health belief construct prevention, in which the HBM is obligatory among individual with skepticism of vaccine acceptance and with a low rate of willingness to pay for a vaccine. Based on the previous studies and considering that skepticism over vaccine acceptance and the low rate of willingness to pay for a COVID-19 vaccine, delivering citizens with accurate health knowledge is the practical way to prevent such problems. Governments must ascertain and propagate proper COVID-19 vaccine-related information [38, 40]. Also, considering health beliefs with health education program could be more serviceable and might be used to construct an HBM intervention [7, 38].

Limitations of this study

The present study is not without limitations. First, the online evaluation methodology experienced a selection bias because only information on the Google form was shared via WhatsApp, Facebook, Instagram, Telegram, and Twitter. Since many people (approximately 61.8%) rely on technology to access online social media services [41], there was a risk that

those (38.2%) who do not use media technology would be unable to access this form. In this study, we didn't test different price ranges for comparison and another limitation was a lack of citizens prevalence from the eastern and central region and an International Standard Classification of Education of <3 education level, which future research might specifically seek to enrollment. Nonetheless, we controlled for a variety of confounding variables, limiting the effect of confounding bias.

Conclusion

Finally, the HE, AVs, and HBM were positively determinant factors of the intention to get vaccinated and willingness to pay for a vaccine. Our key findings show that spirituality was independently correlated with potential vaccine acceptance. The willingness to pay and intention to get vaccinated could be impaired by worries regarding the side-effects of a vaccination interfering with daily activity of citizens. These constructs and independent predictors that were established include an implementation of vaccination strategies which really aim to escalate intention to accept vaccinated and willing to pay for it. These findings offer to health professionals including nursing identifying and incorporating clinical counseling interventions strengthening HE, AVs, HBM, and spirituality to successfully boost the acceptance and willingness to pay. Furthermore, it provided to government policy-making to boost citizen's immunization programs.

Conflicts of interest: None.

Data Availability Statement: The data presented in this study are available on request from the corresponding author and with permission of the Institutional Review Board of Institut Ilmu Kesehatan Strada Indonesia.

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Ethical consideration: This research was performed in accordance with the Helsinki Declaration guidelines and was written informed consent was obtained Ethics Committee of Institut Ilmu Kesehatan Strada Indonesia (reference no.: 2228/KEPK/XII/2020). Informed consent was granted from each respondent online who was assured of anonymity and confidentiality, their freedoms to withdraw from the study whenever and that the input information were collected for academic use only.

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Validation, S.H., Y.A.R., M.D.K., R.A., Y.S.R., Y.W.S., C.W.C., H.T.T.

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Relationship of spirituality, health engagement, health belief and attitudes toward acceptance and willingness to pay for a COVID-19 vaccine

Running head: Acceptance and Willingness to Pay for a COVID-19 Vaccine

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Abstract

Purpose: To explore the wider determinant factor of citizens' spirituality, health engagement, health belief model, and attitudes towards vaccines toward acceptance and willingness to pay for a COVID-19 vaccination.

Methods: A community-based cross-sectional online investigation with convenience sampling was utilized to recruit 1423 citizens from 18 district across Indonesia between December 14, 2020 and January 17, 2021. Descriptive statistics, One-way analysis of variance, Pearson correlation, Independent t-tests, and multiple linear regression were examined.

Results: Spirituality, health engagement and attitude toward vaccine, as well as health beliefs constructs (all score of perceived benefits and barriers) were significant key factors of acceptance vaccine. Interestingly, the spirituality, attitude toward vaccine, and health beliefs constructs including perceived susceptibility, and benefits indicated a significantly higher willingness.

Conclusions: Results demonstrated the utility of spirituality, health engagement, health belief model, and attitudes towards vaccines in understanding acceptance and willingness to pay for a vaccine. Specifically, a key obstacle to the acceptance of and willingness to pay COVID-19 vaccination included a high score of the perceived barrier construct. Moreover, the acceptance of and willingness to pay could be impaired by worries about the side-effects of a COVID-19 vaccination.

Keywords: acceptance; health belief model; health engagement; spirituality; vaccine COVID-19.

Introduction

COVID-19 caused clusters of a complex respiratory syndrome characterized with a novel beta-coronaviruses infection [1]. As of May 31, 2021, the WHO confirmed that 170,051,718 individuals had been infected with COVID-19 worldwide [2]. Additionally, this disease has spread to Indonesia, where approximately 1,816,041 people are reported to be infected, with 50,404 deaths [3]. After scientists discovered this new SARS-CoV-2 strain, vaccines for COVID-19 were rapidly developed to be distributed globally [4,5]. While vaccine programs could substantially alleviate the spread of the virus, one of the problems for policymakers is determining how to motivate their citizens to get vaccinated. Most vaccine skeptics refuse to be vaccinated [6]. Interestingly, Indonesia is unique because citizens typically have extremely spiritual beliefs, health attitude issues [7], and differences in health perspective [8], which may influence acceptance and willingness to pay COVID-19 vaccine.

Acceptance and willingness to pay for a COVID-19 vaccine are critical to the success of a high-coverage vaccination program [9,10]. Recent studies showed that the acceptance of vaccination COVID-19 in the United States [11], Russia [12], Malaysia [9], and Jordan [13] were 67%, 55%, 48.2%, and 37.4%, respectively. Moreover, an epidemiological study in low- or middle-income countries such as Bangladesh, India, Iran, Pakistan, Egypt, Nigeria, Sudan, Tunisia, Brazil, and Chile presented that the acceptance of vaccination was approximately 58.3 % to 80.1% [14]. A global survey showed that differences in acceptance of a vaccination ranged more than 70% among citizens in 19 countries [12]. The majority of the population in Malaysia [9], Chile [15], Ecuador [16], and the US [17] indicated willingness to pay for a vaccination. Previous studies among Indonesian citizens reported that the vaccine acceptance was 93.3% [18] and 78.3% willingness to pay a vaccination COVID-19 [19]. Nevertheless, these studies only concerned socioeconomics, pre-existing susceptibility to COVID-19-related facts, and risk perception variables [18,19].

Spirituality as a therapeutic approach for healthcare systems plays a critical role in encouraging healthy behaviors using the power of faith and beliefs [20]. Also, spirituality is an adaptation in response to the transmission dynamics of COVID-19 [7,21]. Ancient wisdom from spiritual fields can be very useful in encouraging citizens to survive the threat of the COVID-19 pandemic [22]. Indonesia is unique because citizens typically have strong positive spirituality linked to health behaviors and health beliefs [7,23]. Whereas studies of spirituality have seldom been linked to adaptive response, research on spirituality and medical status has been largely [7,21,22], but not exclusively focused on willingness to pay and acceptance a COVID-19 vaccine. Thus, investigating spirituality might be a beneficial valuable approach to promote new insights into implementing vaccination programs.

Remarkably, health engagement (HE) is characterized as private proactivity in the administration of wellbeing related concerns [24] and can improve health behavior [25-27]. However, lack of study to investigate the association between HE and vaccine acceptance [24]. Previous study in Italy presented that vaccine attitudes (AVs) strongly correlated with acceptance a COVID-19 vaccine [24]. Additionally, high scores of HE has been significantly associated with attitude toward against COVID-19 [28]. Consequently, a high level of citizens' health engagement with high vaccine acceptance seems crucial in the case of an COVID-19, as it is a beneficial premise to guarantee the effectiveness of immunization and spread prevention measures of COVID-19 [24].

Health belief model (HBM) might predict health promoting behaviors in terms of belief patterns by understanding the interaction between health behaviors and health services utilization [29,30]. Previous studies revealed that HBM was significantly associated with acceptance and willingness a COVID-19 vaccine [31,32]. Research from Malaysia proved that citizens who believed in the perceived benefits of a vaccination had a positively stronger 2.51-fold risk of acceptance, and the higher score of perceived severity was correlated with a higher

level of willingness to pay for a vaccine [9]. However, few researches have explored the various constructs of the HBM that could predict the acceptance of the COVID-19 vaccine, although researchers have analyzed the acceptance of and willingness to pay for the COVID-19 vaccine [31-33].

Immunization campaigns are indeed considered effective when vaccination programs have a significantly high rate of vaccine acceptance [9,11] and a willingness to pay for it [9]. Interestingly, no study has been conducted on COVID-19 vaccine acceptance and willingness to pay with specific determinations factors such as spirituality, HBM, HE and AVs in Indonesia. To fill these gaps, this study explored how Indonesians accepted the COVID-19 vaccine and their willingness to pay for it. This was accomplished by surveying their spirituality, HE, HBM constructs, and AVs.

Methods

Design and participants

A cross-sectional online survey-based overview during COVID-19 for 18 provinces out of 34 provinces in Indonesia. All the information was gathered utilizing snowball sampling technique. The eligible target population was Indonesian citizens aged between 17 and 65 years old, who understood Bahasa Indonesia, currently stay in Indonesia, and filled the consent form. Citizens who had previously been confirmed with suspected COVID-19 were excluded. The research was administered and reported based on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) protocol (S1 File).

Data collection procedure

The online survey was distributed using a Google Form link that was shared on social media platforms including WhatsApp, Instagram, Telegram, and Facebook. Furthermore, this relies on researchers' technical and personal networks and engaging with and distributing the survey through social media influencers and community leaders. Participants were selected for the study using a simplified snowball sampling technique, and they were asked to forward the invitation to their contacts; the estimated completion time for the survey was 15 minutes. We conducted different procedures to target as many respondents as possible from across the region during the December 15, 2020 to January 12, 2021 data collection period. Finally, 1,423 people responded to our Google form. We used participants email to avoid overlapping response during data collection.

The Google Form link had four sections. (1) Before allowing participants to proceed to the survey questions, the first section informed them of the objective of the study and eligibility requirements. Furthermore, the informed consent was taken by checking the box "Agree," which was required to confirm that they understood the authorization information and met the inclusion and exclusion criteria. Additionally, participants decided to participate voluntarily and with the freedom to withdraw at any time; (2) Second section comprised questions correlated to sociodemographic; (3) Third section comprised questions that assessed the intention to accept being vaccinated and willingness to pay for vaccinated; (4) Fourth section contained 35 questions including HE, AVs, HBM, and spirituality questionnaire. Finally, a page at the end expressed our gratitude, and all individuals who completed the survey were encouraged to persuade new respondents from their contact lists to participate by forwarding the link to the online survey.

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Measurements

Participants were instructed to fulfill the online sociodemographic questionnaire consisting of information on age, income, gender, educational levels, geographical region, marital status, urbanicity, and the pandemic's impact on their income.

Intention to accept vaccine was assesses using one-item question: “Do you intend to accept vaccination for COVID-19?” with response as continuous data of vaccine acceptance on five-point Likert scale; 1 (not likely at all) to 5 (absolutely). This instrument was adapted from previous studies [24]. The total score ranges from 1 to 5, a higher score indicated a more-favorable attitude to acceptance a COVID-19 vaccine.

Willingness to pay a vaccination was evaluated using one-item question: “Are you willing to pay US$17.70~35.40 for a vaccination COVID-19?”. Response this statement was ranked on a five-point Likert scale; 1 (not likely at all) to 5 (absolutely). This instrument was adapted from previous studies [19,24]. The total score ranges from 1 to 5, the higher the score an individual has, the greater their willingness to pay for a vaccine.

The Daily Spiritual Experiences Scale (DSES) contains sixteen questions regarding their spirituality on a 6-point Likert scale; 1 = at no time to 6 = many times a day [34]. Previous study revealed that the Indonesian translation version of the DSES questionnaire-spirituality had Cronbach’s alpha of 0.88 [7]. In our study, the Cronbach's alpha value for spirituality was 0.70 that indicating acceptable reliability. The total score ranges from 16 to 96, the greater the number of experiences points a person has, the greater their spirituality. Participants‘ overall spirituality was categorized, as high if the score was ≥ 72, and low if the score was <72 [7].

In the present study, the questionnaires including HE, AVs, and HBM were assessed for the translation process. After obtaining approval from the original authors, the questionnaires (HE, AVs, and HBM) were independently translated into Indonesian using the forward and back-translation methods. The questionnaires were translated by five translators, a certified translator and four experts in nursing research in Indonesian universities, whose native

language was Indonesian and who were bilingual and fluent in English. The translators were assessing the questionnaire items to be relevant to measure the HE, AVs, and HBM toward acceptance and willingness to pay a COVID-19 vaccination precisely for linguistic and conceptual equivalence. In brief, Indonesian-speaking academics were first contacted to review the translated version for grammatical accuracy and clarity. Thus, four independent bilingual translators completed the back translation of the Bahasa edition into English. In addition, the final Bahasa version was obtained by comparing the original questionnaire with its back translation. Translators were instructed to avoid metaphors, colloquial terminology, and hypothetical statements, and to use simple sentences. Initially, prior to completing the formal online survey, we conducted a pilot study with 60 residents in the close surroundings of the researchers to determine the questionnaire's readability and reliability". Further, we reviewed cognitive debriefing results and the finalized version with content validity index (CVI) and kappa (*k**). Finally, we conducted an analysis of the reliability and validity with the Kaiser-Meyer-Olkin (KMO) test, the Bartlett's test of sphericity value, Cronbach's alpha and item-total correlation coefficient.

Health engagement (HE) consists of six questions with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The total score ranges from 6 to 30, a greater value indicating greater HE [24]. Interestingly, we defined HE score with response as continuous data on five-point Likert scale; 1 (definitely disagree) to 5 (strongly agree). Also, we defined HE scores as categorical data for disagreement (definitely disagree/disagree/strongly disagree) and agreement (agree/strongly agree) presented in S1 Table. In our study, HE questionnaire English was translated into Indonesian and had a CVI of 0.93, *k** of 0.94 to 1, the value of the KMO test was 0.72 and the Bartlett's test of sphericity value was significant ($p < 0{,}001$). Furthermore, Cronbach's alpha of 0.91 with item-total correlation coefficient score was 0.68 to 0.88.

Vaccine attitudes (AVs) consist of two questions with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The total score ranges from 2 to 10, a greater value indicating greater AVs. For our study analysis, we defined AVs score with response as continuous (total score). Also, we defined VAs scores involving the agreement (strongly agree/agree), and disagreement (neither agree nor disagree, strongly disagree/disagree) presented in S1 Table. The questions as follows; (1) "COVID-19 vaccination could have serious collateral effects on my own health"; and (2) "I am sure of the vaccine's effectiveness in preventing infectious diseases such as COVID-19" [24]. The Indonesian version of the VAs questionnaire had an acceptable CVI 0.95 with *k** of 0.98 to 1. The value of the KMO test was 0.69 and the Bartlett's test of sphericity value was significant ($p < 0{,}001$). Furthermore, a total Cronbach's alpha of 0.70 with item-total correlation coefficient score was 0.60 and 0.68 in our study.

HBM constructs a section which included perceived benefits (PBE), susceptibility (PSU), barriers (PBA), and severity (PSE) and consists of 12 items questions. Response this statement was ranked on a 7-point Likert-scale; 1 (strongly disagree) to 7 (strongly agree) [35]. Also, HBM constructs were used in COVID-19 vaccinations previous research [9,32]. The total score ranges from 12 to 84, a higher score indicates a good health belief, except for the PBA construct. In the present study, we defined HBM score with response as continuous data or total score in each construct. Moreover, the detailed HBM constructs score involve the agreement (somewhat agree/agree/strongly agree), and disagreement (somewhat disagree/disagree/ strongly disagree /neither agree nor disagree) presented in S2 Table. In our study, the questionnaire of the HBM Indonesian version presented that the CVI was 0.95 with *k** of 0.89 to 0.92. The value of the KMO test was 0.61 and the Bartlett's test of sphericity value was significant ($p < 0{,}001$). Furthermore, the total of Cronbach's alpha of 0.81 with item-total correlation coefficient score was 0.63 to 0.71.

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Sample size and power calculation

Sample size was estimated based on previous study [36] with the formula; $n = u_a p\ (1 - p)/\delta^2$, where n = minimum desired sample size, u_a = the standard normal deviation, usually set as 1.96 which corresponds to 5% level of significance. p = the average rate of acceptance of vaccine was estimated on the basis of the available literature and its value was set at 85% [37], δ = of precision set at 0.015. The calculated minimum sample size was 1,111 (n = 1.96 x 0.85 x (1-0.85)/0.015^2 = 1,111). We expected a potential missing data of 20% with a large population and thus aimed to recruit at least 1,388 participants. Finally, during one month data collection, the total sample consisted of 1,423 Indonesian citizens.

The sample size was calculated based on estimates from the distribution of the general population as reported by the Central bureau of statistics, Indonesia. Proportions from eastern, central and western regions of Indonesia are reported at 2.76%, 16,14% and 81.10% respectively [38]. In our study, we reached participants from all regions of Indonesia and obtained 11.9%, 16.9% and 71.2% from each base, which has a similar pattern to the proportional distribution of these regions in the general population.

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Data analysis

Descriptive analyses statistic was utilized to evaluate demographic, HE, AVs, health beliefs, and spirituality between groups. The findings are reported as percentages (%) and frequencies (n). The mean and standard deviation (SD) of continuous variables were calculated using an independent t-test, or one-way analysis of variance (ANOVA) and Pearson correlation. The variance inflation factor (VIF) of 10 was used to calculate multicollinearity [39]. This study had a maximum VIF of 4.946 for vaccination acceptance and of 4.996 for willingness to pay a vaccine, s demonstrates that the results had a low level of multicollinearity. Absolute values

for skewness and kurtosis were used to assess normality of the data; skewness value of -0.264 and kurtosis value of 1.677 indicated a normal distribution [40]. Multiple linear regression was used to obtain adjusted beta coefficients (β) with 95% confidence intervals (CIs) for willingness to pay and acceptance a vaccine, and were correlated to exposures of interest (HE, AVs, HBM, and spirituality) after adjusted for potential covariate factors. For all statistical analyses, SPSS Vers. 25 IBM (Armonk, NY, USA) was utilized, and statistical significance was defined as $p<0.05$.

Ethical considerations

All study protocol was approved by Ethics Committee of Institut Ilmu Kesehatan Strada Indonesia (Reference No.: 2228/KEPK/XII/2020). Informed consent was granted from each respondent online who was assured of anonymity and confidentiality, their freedoms to withdraw from the study whenever and that the input information were collected for academic use only.

Results

Table 1 presented that there were significant differences by geographical region in vaccine acceptance and willingness to pay for the vaccine. However, we found no significant difference in marital status or education level of vaccine acceptance and willingness to pay. Willingness to pay for the vaccine also significantly differed by gender, age, income, urbanicity, and the pandemic's impact on their income, but not in vaccine acceptance among Indonesian citizens.

Table 1. Relationships of distributions of demographic and determinant factors with acceptance of and willingness to pay for COVID-19 vaccine (*n*=1423).

Variable	All participants (*n*=1423) *n* (%)	Acceptance		Willingness to pay	
		Mean (SD)	*p* value	Mean (SD)	*p* value
Gender [a]					
Men	602 (42.3)	3.85 (1.08)	0.332	2.69 (1.28)	0.006
Women	821 (57.7)	3.90 (0.92)		2.51 (1.09)	
Age (years) [b]					
17~24	640 (45.0)	3.84 (1.01)	0.216	2.50 (1.13)	0.047
25~39	550 (38.7)	3.94 (0.93)		2.66 (1.21)	
>40	233 (16.4)	3.88 (1.09)		2.64 (1.20)	
Marital status [a]					
Not married	861 (60.5)	3.90 (0.97)	0.380	2.57 (1.17)	0.598
Married	562 (39.5)	3.85 (1.02)		2.60 (1.19)	
Education [a]					
ISCED <3	51 (3.6)	3.84 (0.90)	0.772	2.29 (1.10)	0.072
ISCED ≥3	1372 (96.4)	3.88 (0.99)		2.60 (1.18)	
Income (IDR) [b]					
<2.5 million	782 (55.0)	3.89 (0.98)	0.585	2.46 (1.13)	<0.001
2.5~5 million	432 (30.4)	3.88 (0.95)		2.72 (1.15)	
6~10 million	166 (11.7)	3.82 (1.09)		2.63 (1.21)	
>10 million	43 (3.0)	4.05 (1.21)		3.30 (1.64)	
Geographical region [b]					
Western region	1013 (71.2)	3.87 (0.97)	0.013	2.48 (1.12)	<0.001
Eastern region	169 (11.9)	4.08 (1.01)		1.28 (0.10)	
Central region	241 (16.9)	3.80 (1.04)		1.24 (0.08)	
Urbanicity [a]					
Rural	635 (44.6)	3.91 (0.95)	0.404	2.51 (1.17)	0.028
Urban	788 (55.4)	3.86 (1.02)		2.65 (1.18)	
Pandemic's impact on income [a]					
No impact	733 (51.5)	3.88 (0.99)	0.831	2.74 (1.19)	<0.001
With an impact	690 (48.5)	3.89 (0.99)		2.42 (1.14)	

Data are presented as the mean ± standard deviation (SD), or frequency and percentage. COVID-19 = coronavirus disease 2019, ISCED = international standard classification of education; IDR = Indonesian rupiah. [a] an independent *t*-test or; [b] a one-way ANOVA. $p<0.05$ indicates statistical significance

We presented specific correlation spirituality, HE, AVs and HBM constructs variable for vaccine acceptance and willingness to pay for the vaccine in Table 2. Not only spirituality (r = 0.179, $p < 0.001$) but also, HE (r = 0.718), AVs (r = 0.677), and PSU (r = 0.335), PSE (r = 0.316), PBE (r = 0.392) were positively correlated with acceptance a vaccine. Moreover, HE,

AVs, and all HBM construct ware positively correlated with willingness to pay a vaccine. Contrarily, spirituality (r = −0.057), and PBA (r = −0.086) were negatively correlated with willingness to pay a vaccine.

Table 2. Correlation of citizen's spirituality, health engagement, and attitudes with their acceptance and willingness to pay for the COVID-19 vaccine (*n*=1423)

Variables	All participants	Acceptance		Willingness to pay	
	Mean (SD)	r	*p* value	r	*p* value
Spirituality	72.32 (8.15)	0.179	<0.001	-0.057	0.031
Health engagement (HE)	23.12 (4.33)	0.718	<0.001	0.269	<0.001
Attitudes towards vaccines (AVs)	6.87 (1.70)	0.677	<0.001	0.266	<0.001
Health beliefs – Perceived susceptibility (PSU)	14.14 (4.51)	0.335	<0.001	0.276	<0.001
Health beliefs – Perceived severity (PSE)	14.04 (4.18)	0.316	<0.001	0.240	<0.001
Health beliefs – Perceived benefits (PBE)	14.27 (3.91)	0.392	<0.001	0.328	<0.001
Health beliefs – Perceived barriers (PBA)	11.26 (3.61)	-0.303	<.001	-0.086	0.001

Data are presented as the mean ± standard deviation (SD), correlation and significant value. COVID-19 = coronavirus disease 2019; AVs = attitude towards vaccines; HE = health engagement, PBA = perceived barriers; PBE = perceived benefits; PSE = perceived severity; PSU = perceived susceptibility. *p* values were calculated using a Pearson correlation; $p<0.05$ indicates statistical significance.

Table 3 summarizes the findings of the multiple linear regression performed of overall score of spirituality, HE, HBM constructs, and AVs for vaccine acceptance and willingness to pay. A higher spirituality, increases the coef. β of having the acceptance to vaccinate against COVID-19 (Adjusted coef. β = 0.01, 95% CI = 0.01~0.02). However, a higher spirituality, declines the coef. β of having the willingness to pay a vaccine (Adjusted coef. β = -0.01, 95% CI = -0.02~-0.01). Moreover, higher HE, AVs, and PBE increases the coef. β of having the

acceptance to vaccinate, but higher PBA score decline the coef. β of having the acceptance to vaccinate.

Table 3. Summary of linear regression analysis demonstrating citizen's spirituality, health engagement, and attitudes with their acceptance and willingness to pay for the COVID-19 vaccine (*n*=1423)

Variable	Acceptance		Willingness to pay	
	Unadjusted coef. β (95% CI)	**Adjusted coef. β (95% CI)[a]**	**Unadjusted coef. β (95% CI)**	**Adjusted coef. β (95% CI)[b]**
Spirituality	0.02 (0.02~0.03)**	0.01 (0.01~0.02)**	-0.01 (-0.02~-0.01)*	-0.01 (-0.02~-0.01)*
Health engagement (HE)	0.16 (0.16~0.17)**	0.09 (0.08~0.10)**	0.07 (0.06~0.09)**	0.03 (0.01~0.05)*
Attitudes towards vaccines (AVs)	0.39 (0.37~0.42)**	0.18 (0.16~0.21)**	0.18 (0.15~0.22)**	0.04 (0.01~0.09)*
Health beliefs – Perceived susceptibility (PSU)	0.07 (0.06~0.08)**	0.01 (-0.01~0.02)	0.07 (0.06~0.09)**	0.04 (0.01~0.07)*
Health beliefs – Perceived severity (PSE)	0.08 (0.06~0.09)**	0.02 (-0.01~0.03)	0.07 (0.05~0.08)**	-0.01 (-0.04~0.02)
Health beliefs – Perceived benefits (PBE)	0.10 (0.09~0.11)**	0.03 (0.02~0.04)**	0.10 (0.08~0.11)**	0.07 (0.05~0.08)**
Health beliefs – Perceived barriers (PBA)	-0.08 (-0.10~-0.07)**	-0.03 (-0.04~-0.02)**	-0.03 (-0.05~-0.01)*	-0.01 (-0.03~0.01)

AVs = attitude towards vaccines; β = beta; CIs = confidence intervals; COVID-19 = coronavirus disease 2019; HE = health engagement; PBA = perceived barriers; PBE = perceived benefits; PSE = perceived severity; PSU = perceived susceptibility. Adjusted beta-coefficients (coef.) and 95% CIs were estimated using a multiple linear regression after adjusting for [a] geographical region or [b] gender, age, income, geographical region, urbanicity, pandemic impact on income. * $p<0.05$; ** $p<0.001$.

Additionally, we observed that the means (SD) of vaccine acceptance and willingness to pay were significantly higher for citizens who agreed with all statements of HE, and AVs.

Moreover, a higher score of acceptance was identified in citizens with a higher spirituality score of ≥72, but a willingness to pay was not significant are outlined in S1 Table. We also observed that the means (SD) of vaccine acceptance and willingness to pay were significantly higher for citizens who agreed with health beliefs constructs (PSU, PSE, and PBE). In analyzing citizens' PBA, those who reported disagreeing with the statements "the side-effects of vaccination interfere with my usual activities" (PBA1), "I am scared of needles" (PBA2), and "I cannot be bothered to get a vaccination" (PBA3) were positively associated with high vaccine acceptance scores, but were not correlated with a willingness to pay, except for PBA3 are outlined in S2 Table.

S3 Table presented the findings of the multiple linear regression performed of all the indicators of spirituality, HE, health beliefs, and AVs for vaccine acceptance and willingness to pay. Further statistical test showed that getting high spirituality was connected with a higher vaccine acceptance value (β = 0.14, 95% CI = 0.07~0.21), and was significantly associated with a willingness to pay (β = -0.25, 95% CI = -0.37~-0.14) among Indonesian citizens. Both all items of HE and AVs were the strongest determining factors of the vaccine acceptance score. However, HE items 1 to 5 and AVs1 were not correlated with a willingness to pay after adjusting for confounding variables. Finally, S4 Table revealed that the six items of health beliefs constructs (PSU1, PSE3, PBE1, PBE3, PBA1, and PBA3) were the strongest determining factors of the vaccine acceptance, while other items of health beliefs (PSU2, PSU2, PSE1, PSE2, PBE2, and PBA2) were not significant predictors of the vaccine acceptance score after adjusting for confounding variables. Citizens who justified (chose 'agree') all items of HE and AV1 had no significant correlation with the willingness to pay score compared to those who responded with 'disagree' by adjustment for possible confounding factors. Citizens who agreed with the statement PSU1, PBE2, and PBA2 had significantly higher scores for willingness to pay, and they were sure of the vaccine's

effectiveness in preventing infectious diseases (AVs2) (β = 0.47, 95% CI = 0.25~0.68; β = 0.24, 95% CI = 0.05~0.42; β = 0.17, 95% CI = 0.01~0.34, and β = 0.17, 95% CI = 0.01~0.33, respectively). Moreover, citizens who also agreed with the statement that they could not be bothered to get a vaccination (PBA3) had significantly lower scores for willingness to pay (β = -0.44, 95% CI = -0.57~-0.32).

Discussion

To the best of our knowledge, this is the first study to assess Indonesian acceptance and willingness to pay for a COVID-19 vaccine. In the current study, Indonesian citizens who agreed with having higher spirituality were statistically related with higher scores of vaccine acceptance among the Indonesian population. However, higher spirituality was significantly related with higher score of willingness to pay for a COVID-19 vaccine after adjustment for possible confounding factors. Similarly, Thomas et al. [41] reported that spirituality was strongly associated with parents' perceptions of their influence over and ways of dealing with health problems potentially related to the human papillomavirus vaccination. Remarkably, the occurrence of challenges escalated by the COVID-19 disease outbreak demonstrates the magnitude of spirituality [7], but spirituality's effects on acceptance and willingness to pay for a vaccine have not exclusively been explored or investigated. Indonesia has a diverse culture and extremely unique spiritual beliefs. This rare situation requires a holistic care of nursing including spiritual needs and how those needs are related to health behaviors and health beliefs [7,23]. Conceivably, spirituality encourages acceptance-based responses, specifically, adaptive responses involving (a) being aware of and accepting of one's own emotional experiences, (b) learning a variety of coping mechanisms so that one can respond flexibly and interactively to emotional experiences while remaining committed to achieving recovery-related priorities, (c) implementing adaptive mechanisms as these states appear, and showing great outcomes as a

result of those actions [42]. Our current findings indicated that spirituality might be strongly correlated with a willingness to pay and vaccine acceptance. Consequently, well-designed strategies to prevent or grow spirituality may even be important to increase the desire to be vaccinated.

It was found that HE was significantly related with acceptance vaccination, and it was a good predictor of individuals maintaining and improving a good attitude toward the vaccine [24]. Notably, those findings aligned with our results where HE and AVs indicated higher vaccine acceptance. A similar study, suggested that a comprehensive understanding of student' viewpoints on supporting their HE and consciousness may enable planning of effective responses and multidisciplinary educational strategies, including underlying AVs that influence perspectives about acceptance of the vaccine [43]. Therefore, these data suggested that the HE and AVs are predictive of COVID-19 vaccination acceptance. Currently, no studies have explored relationships between HE and a willing to pay for a vaccination. Of note, HE was a critical predictor of preventive behaviors [44]. In our present findings, positive AVs1 was not correlated with a willingness to pay for a vaccine, but AVs2 was related with a willingness to pay for a vaccine.

Our results were aligned with a previous study in terms of identifying that the HBM-PSU was related to willing to pay [9]. In particular, our findings also evaluated the PSE, but only one question was related to being afraid of getting COVID-19, and it was significantly associated with a high vaccine acceptance score but not significantly with a willingness to pay for the vaccination. Similar HBM outcomes, specifically PSE, were identified in a Malaysian population. Additionally, they showed that the public strong reliance of the HBM-PSE was correlated with a willingness to pay for a vaccine, but it was not positively correlated with vaccine acceptance [9]. However, a large community study of 1200 citizens in Hong Kong revealed that the PSE had a 1.16-fold higher score of vaccine acceptance after adjusting for

393 covariates [45]. These conflicting results may be attributable to monthly income [9] and low
394 levels of knowledge about vaccine programs [18]. In our data, high-scores on PBE, i.e., PBE1
395 and PBE3," were strongly determinants of vaccine acceptance after adjusting for covariates.
396 Nevertheless, citizens with high scores on PBE of the immunization could decline their chances
397 of getting COVID-19. This survey indicated that in terms of benefits, citizens who intended to
398 receive the vaccine saw extraordinarily strong PBE in getting the vaccination to ensure their
399 own and others' safety, linier to what Shmueli et al. suggested that vaccination enforcement
400 relies on personal risk-benefit perceptions [31]. Similar to our study, a cross-sectional study in
401 Kenya revealed that perceptions of vaccine benefits were associated with a willingness to pay
402 for a Peste des Pettis Ruminants vaccine [46]. Citizens with health beliefs about side-effects of
403 the vaccine interfering with their daily activities and those who could not be bothered to get an
404 immunization were correlated with vaccine acceptance, but only one item of PBA "cannot be
405 bothered to get an immunization" was correlated with willingness to pay. The present study
406 aligned with previous investigations which suggested that citizens with a lower score for
407 worrying about possible side-effects of the vaccination had a 1.81-fold lower score for vaccine
408 acceptance, and no significant correlation with a willingness to pay for a COVID-19
409 vaccination [9]. Moreover, a high score on the PBA of "cannot be bothered to get the vaccine"
410 was a significant predictor of a lower vaccine acceptance score among 799 general citizens in
411 the US [32]. The increase in COVID-19-related skepticism of vaccine acceptance and the low
412 rate of willingness to pay for a vaccine among Indonesian residents require further priority
413 advocacy of health belief construct prevention, in which the HBM is obligatory among
414 individual with skepticism of vaccine acceptance and with a low rate of willingness to pay for
415 a vaccine. Based on the previous studies and considering skepticism over vaccine acceptance
416 and the low rate of willingness to pay for a COVID-19 vaccine, delivering citizens with
417 accurate health knowledge is the practical way to prevent such problems. Governments must

ascertain and propagate proper COVID-19 vaccine-related information [45,47]. Also, considering health beliefs with health education programs could be more serviceable and might be used to construct an HBM intervention [9,45].

Limitations of this study

The present study is not without limitations. First, the online evaluation methodology experienced a selection bias because only information on the Google form was shared via WhatsApp, Facebook, Instagram, Telegram, and Twitter. Since many people (approximately 61.8%) rely on technology to access online social media services [48], there was a risk that those (38.2%) who do not use media technology would be unable to access this form. In this study, we didn't test different price ranges for comparison and another limitation was a lack of citizens' prevalence from the eastern and central region and an International Standard Classification of Education of <3 education level, as this may implicate the generalizability of the findings and which future research might specifically seek to enroll. However, we adjusted for a considerable number of potential confounding factors to be obtained by performing a multiple linear regression, thus minimizing the effect of an unequal distribution.

Conclusion

Finally, the HE, AVs, and HBM were positively determinant factors of the intention to get vaccinated and willingness to pay for a vaccine. Our key findings show that spirituality was independently correlated with potential vaccine acceptance and willingness to pay for a vaccine. The willingness to pay and intention to get vaccinated could be impaired by worries regarding the side-effects of a vaccination interfering with daily activity of citizens. These constructs and independent predictors that were established include an implementation of

442 vaccination strategies which really aim to escalate intention to accept vaccinated and willing

to pay for it. Our findings offer to health professionals including nursing identifying and incorporating clinical counseling interventions strengthening HE, AVs, HBM, and spirituality to successfully boost the acceptance and willingness to pay. Furthermore, it provided government policy-making to boost citizen's immunization programs. The data gathered from this survey would provide scientific evidence for developing targeted programs to improve acceptance and willingness to pay for vaccines and enhance vaccine management strategic decisions for current and future.

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Author Contributions

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All authors have read and agreed to the published version of the manuscript.

Supporting information

S1 File. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) protocol.

S1 Data. Characteristics and acceptance and willingness data

S1 Table. Comparisons of Citizen's Spirituality, Health Engagement, and Attitudes with Their Acceptance and Willingness to Pay for the COVID-19 Vaccine (*n*=1423)

S2 Table. Comparisons of Citizen's Health Beliefs with Their Acceptance and Willingness to Pay for COVID-19 Vaccine (*n*=1423)

S3 Table. Adjusted Beta-Coefficients and 95% Confidence Intervals (CIs) of Spirituality, Health Engagement, and Attitude Toward Vaccine with Participants' Acceptance and Willingness to Pay for COVID-19 Vaccine (*n*=1423)

S4 Table. Adjusted Beta-coefficients and 95% Confidence Intervals (CIs) of Health Beliefs Constructs with Participants' Acceptance and Willingness to Pay for COVID-19 Vaccine (*n*=1423)

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RE: [PONE-D-22-14548] - [EMID: ccb1e548dd430d0c]-Version 1

Response to Reviewer 1 Comments

Dear Reviewer #1,

Thank you for considering our manuscript and for the valuable suggestions, also the opportunity to resubmit a revised manuscript, which helps us to improve the article. We carefully revised the manuscript in accordance with your comments. The revised sections of the manuscript are marked with red color. Our point-by-point responses to the comments are as follows. We very much hope the revised manuscript is accepted for publication in PLOS ONE. Thank you very much for your consideration.

Point 1. Please carry out an extensive English language editing.

Response 1: Thank you for your valuable suggestion. This revised manuscript was edited by Taipei Medical University Academic Editing.

Point 2. The methodology, already compromised using a convenient sampling technique, needs further justification as to how the single responder did not use multiple social media platforms to respond to your questionnaire.

Response 2: Thank you for your comments. With the issue of duplicate response, we used participants email to avoid overlapping response during data collection (Please see line 139–140 on page 6)

Point 3. There are numerous limitations to your study, especially with regards to the generalizability of the findings and also the validity of the tools used for assessment.

Response 3: Thank you for your comments. We add several new information to clarify and revise this point to make it clearer and more precise based on the reviewer's suggestion as follows:

Generalizability:

"The sample size was calculated based on estimates from the distribution of the general population as reported by the Central bureau of statistics, Indonesia. Proportions from eastern, central and western regions of Indonesia are reported at 2.76%, 16,14% and 81.10% respectively [38]. In our study, we reached participants from all regions of Indonesia and obtained 11.9%, 16.9% and 71.2% from each base, which has a similar pattern to the proportional distribution of these regions in the general population" (Please see line 240–245 on page 10).

"Another limitation was a lack of citizens' prevalence from the eastern and central region and an International Standard Classification of Education of <3 education level, as this may implicate the generalizability of the findings and which future research might specifically seek to enroll. However, we adjusted for a considerable number of potential confounding factors to be obtained by performing a multiple linear regression, thus minimizing the effect of an unequal distribution" (Please see line 428–433 on page 19).

Validity of the tools used for assessment

In our manuscripts we already mention content validity index (CVI) and kappa (*k**). Moreover, we add new result of The Kaiser–Meyer–Olkin (KMO), kappa, Bartlett's tests of sphericity, a Cronbach's alpha and item-total correlation analysis were used to determine validity and reliability of the tools used for assessment (Please see line 191–194 on page 8).

Point 4. Please add a section on the validity of the assessment tool utilized.

Response 4: Thank you for your valuable comment and suggestion. In this revised manuscript, we added a description to make clear the validity of the assessment tool utilized based on the reviewer's suggestion as follows in the section of the methods of our study.

"Further, we reviewed cognitive debriefing results and the finalized version with content validity index (CVI) and kappa (*k**). Finally, we conducted an analysis of the reliability and validity with the Kaiser-Meyer-Olkin (KMO) test, the Bartlett's test of sphericity value, Cronbach's alpha and item-total correlation coefficient" (Please see line 191–194 on page 8).

"In our study, HE questionnaire English was translated into Indonesian and had a CVI of 0.93, *k** of 0.94 to 1, the value of the KMO test was 0.72 and the Bartlett's test of sphericity value was significant ($p < 0{,}001$). Furthermore, Cronbach's alpha of 0.91 with item-total correlation coefficient score was 0.68 to 0.88" (Please see line 200–204 on page 8).

"The Indonesian version of the VAs questionnaire had an acceptable CVI 0.95 with *k** of 0.98 to 1. The value of the KMO test was 0.69 and the Bartlett's test of sphericity value was significant ($p < 0{,}001$). Furthermore, a total Cronbach's alpha of 0.70 with item-total correlation coefficient score was 0.60 and 0.68 in our study" (Please see line 212–216 on page 9).

"In our study, the questionnaire of the HBM Indonesian version presented that the CVI was 0.95 with *k** of 0.89 to 0.92. The value of the KMO test was 0.61 and the Bartlett's test of sphericity value was significant ($p < 0{,}001$). Furthermore, a total of Cronbach's alpha of 0.81 with item-total correlation coefficient score was 0.63 to 0.71" (Please see line 225–229 on page 9-10).

Point 5. Please be consistent in using the terms; multivariate and multiple regression, both have different understanding.

Response 5: Thank you for your valuable comment and suggestion. We revised "multivariate regression" to "multiple regression" (Please see abstract, line 38 on page 2).

Point 6. Please avoid using abbreviations in the abstract.

Response 6: Thank you for your valuable comment and suggestion. We appreciate this reviewer's comment. In this revised manuscript, we avoid using abbreviations in the conclusions of abstract section.

"Conclusions: Results demonstrated the utility of spirituality, health engagement, health belief model, and attitudes towards vaccines in understanding acceptance and willingness to pay for a vaccine. Specifically, a key obstacle to the acceptance of and willingness to pay COVID-19 vaccination included a high score of the perceived barrier construct. Moreover, the acceptance of and willingness to pay could be impaired by worries about the side-effects of a COVID-19 vaccination" (Please see abstract, line 45–50 on page 2).

Point 7. Please elaborate on the implications of the findings from your investigation.

Response 7: Thank you very much. We appreciate this reviewer's comments. In this revised manuscript, we added a description about implications of this study as follows in the section of the conclusion

"Our findings offer to health professionals including nursing identifying and incorporating clinical counseling interventions strengthening HE, AVs, HBM, and spirituality to successfully boost the acceptance and willingness to pay. Furthermore, it provided to government policy-

making to boost citizen's immunization programs. The data gathered from this survey would provide scientific evidence for developing targeted programs to improve acceptance and willingness to pay vaccine and enhance vaccine management strategic decisions for current and future" (Please see abstract, line 443–449 on page 20).

thank you

Response to Reviewer 2 Comments

Dear Reviewer #2,

Thank you for considering our manuscript and for the valuable suggestions, also the opportunity to resubmit a revised manuscript, which helps us to improve the article. We carefully revised the manuscript in accordance with your comments. The revised sections of the manuscript are marked with red color. Our point-by-point responses to the comments are as follows. We very much hope the revised manuscript is accepted for publication in PLOS ONE. Thank you very much for your consideration.

Point 1. In the abstract. All abbreviations should be defined.

Response 1: Thank you very much. We appreciate your comment. In this revised manuscript, we avoid using abbreviations based on reviewer's comment and provide full name of the abbreviations in the abstract section as follows;

"Conclusions: Results demonstrated the utility of spirituality, health engagement, health belief model, and attitudes towards vaccines in understanding acceptance and willingness to pay for a vaccine. Specifically, a key obstacle to the acceptance of and willingness to pay COVID-19 vaccination included a high score of the perceived barrier construct. Moreover, the acceptance

of and willingness to pay could be impaired by worries about the side-effects of a COVID-19 vaccination" (Please see abstract, line 44–49 on page 2).

Point 2. If supported by the journal format. I recommend the authors to make a list of abbreviations.

Response 2: Thank you for your valuable comment and suggestion. All abbreviations have been explained at the beginning of the previous sentences follow the submission guidelines as follows;

Abbreviations: Adjusted beta coefficients (β); Content validity index (CVI); Confidence intervals (CIs); Coronavirus disease 2019 (COVID-19); Daily spiritual experiences scale (DSES); Exploratory factors analysis (EFA), Health belief model (HBM); Health engagement (HE); IDR = Indonesian rupiah; ISCED = International standard classification of education; Kaiser-Meyer-Olkin (KMO); One-way analysis of variance (ANOVA); Perceived barriers (PBA), Perceived benefits (PBE); Perceived severity (PSE); Perceived susceptibility (PSU), Standard deviation (SD), Vaccine attitudes (AVs); Variance inflation factor (VIF); World Health Organization (WHO).

Point 3. The English should be checked and revised. The use of decimal separator should be taken carefully, such as "50.404 having died".

Response 3: Thank you for your valuable comments and suggestions. In order to make data better presented, we reorganized the sentences based on the reviewer's suggestion.

"Additionally, this disease has spread to Indonesia, where approximately 1,816,041 people are reported to be infected, with 50,404 deaths" (Please see line 61–63 on page 3)

Point 4. The logical flow is confusing, for instance paragraph 1 and 2 in the introduction.

Response 4: Thank you for your valuable comment. In order to make manuscripts to be better presented with precise and logical flow, we re-organize the sentences (paragraph 1 and 2) based on the reviewer's suggestion as follows;

"COVID-19 caused clusters of a complex respiratory syndrome characterized with a novel beta-coronaviruses infection [1]. As of May 31, 2021, the WHO confirmed that 170,051,718 individuals had been infected with COVID-19 worldwide [2]. Additionally, this disease has spread to Indonesia, where approximately 1,816,041 people are reported to be infected, with 50,404 deaths [3]. After scientists discovered this new SARS-CoV-2 strain, vaccines for COVID-19 were rapidly developed to be distributed globally [4, 5]. While vaccine programs could substantially alleviate the spread of the virus, one of the problems for policymakers is determining how to motivate their citizens to get vaccinated. Most vaccine skeptics refuse to be vaccinated [6]. Interestingly, Indonesia is unique because citizens typically have extremely spiritual beliefs, health attitude issues [7], and differences in health perspective [8], which may influence acceptance and willingness to pay COVID-19 vaccine." (Please see paragraph 1 in the introduction, line 59–69 on page 3)

Point 5. Statement "Vaccine acceptance and willingness to pay.." needs citation. I recommend: Sallam et al. Narra J 2022; 2(1): e74 – doi: 10.52225/narra.v2i1.74

Response 5: Thank you for your valuable comment and suggestion. In this revised manuscript, we added a new reference number10 based on reviewer's suggestion as follows;

"Acceptance and willingness to pay for a COVID-19 vaccine are critical to the success of a high-coverage vaccination program [9, **10**]" (Please see line 71 on page 3)

Point 6. After this full sentence, "Recent studies shown that the acceptance of vaccination…" I recommend to include this study because it longitudinally compare data from multiple countries Rosiello et al. Narra J 2021; 1(3): e55-doi: 10.52225/narra.v1i3.55

Response 6: Thank you for your valuable comment and suggestion. In this revised manuscript, we added an information and new reference based on reviewer's suggestion as follows;

"Moreover, an epidemiological study in low- or middle-income countries such as Bangladesh, India, Iran, Pakistan, Egypt, Nigeria, Sudan, Tunisia, Brazil, and Chile presented that the acceptance of vaccination was approximately 58.3 % to 80.1%" (Please see line 73–76 on page 3)

Point 7. Introduction is too long. Many redundant paragraphs, I recommend to trim some of them.

Response 7: Thank you for your valuable comment. In order to make data better presented, we reorganized (which were marked with red color) and trimmed some descriptions based on the reviewer's suggestion (Please see introduction section, line 59–118 on page 3–5).

Point 8. "18 provinces in Indonesia" out of how many provinces?

Response 8: Thank you for your valuable comment. In this revised manuscript, we added an information based on reviewer's suggestion as follows;

"A cross-sectional online-based overview during COVID-19 for 18 provinces out of 34 provinces in Indonesia" (Please see line 122–123 on page 5)

Point 9. "the most accessible online media networks used by Indonesian citizens" Needs citation or removed.

Response 9: Thank you for your valuable comment and suggestion. We removed "the most accessible online media networks used by Indonesian citizens" based on the reviewer's suggestion.

Point 10. "Indonesian citizens" What parameters determine the participants are Indonesian citizens. Do you have any specific inclusion/exclusion criteria for the citizenship?

Response 10: Thank you for your valuable comment. In this revised manuscript, we added an information based on reviewer's suggestion as follows;

Indonesian citizens parameters are the original Indonesians and foreign nationals who are legally recognized as Indonesian citizens currently live in Indonesia.

"The eligible target population was Indonesian citizens aged 17 until 65 years, who understood Bahasa Indonesia, currently stay in Indonesia, and filled the consent form. Citizens who had previously been confirmed with suspected COVID-19 was excluded" (Please see line 124–126 on page 5)

Point 11. "1,423 samples" how this number is determined?

Response 11: Thank you for your valuable comment. In this revised manuscript, we added a sample size calculation based on reviewer's suggestion as follows;

"Sample size was estimated based on previous study [36] with the formula; $n = u_a p\ (1 - p)/\delta^2$, where n = minimum desired sample size, u_a = the standard normal deviation, usually set as 1.96 which corresponds to 5% level of significance. p = the average rate of acceptance of

vaccine was estimated on the basis of the available literature and its value was set at 85% [37], δ = of precision set at 0.015. The calculated minimum sample size was 1,111 (n = 1.96 x 0.85 x (1- 0.85)/0.015^2 = 1,111). We expected a potential missing data of 20% with a large population and thus aimed to recruit at least 1,388 participants. Finally, during one-month data collection, the total sample consisted of 1,423 Indonesian citizens" (Please see line 232–239 on page 10).

Point 12. Include the p value when describing the results. Add 0 before (.) in decimal

Response 12: Thank you for your valuable comment and suggestion. In order to make data to be better presented, we add "0" before "." in decimal (results *p* value) based-on the reviewer's suggestion (Please see Table 1, line 276–78 on page 11-12; Table 2, line 290-292 on page 13, Table 3, line 314 on page 14).

Point 13. In the table footnote, authors indicate * for statistically significant at p<0.05 and ** -- at p<0.001. But no asterisk was put on the table data.

Response 13: Thank you for your valuable comment. In this revised manuscript, we deleted "* *p*<.05; ** *p*<.001" in Table 1 footnote (Please see the footnote of Table 1; line 280 on page 12).

Point 14. The data are too many and confusing. Please only include significant data on the paper. The rest can be put in Supplementary file. Regardless, this is just a suggestion.

Response 14: Thank you for your valuable comment and suggestion. In order to make manuscripts to be better presented, we organize all data results and several data put in supplementary file based on the reviewer's suggestion (Please see results sections; line 271–347 on page 11–16).

Point 15. Again. The discussion has rather confusing logical flows. For example, the authors highlight the significance of their work at the beginning of the subsection. This leads the explanations to obtain inadequate comparison. In addition, authors may divide the discussion into several subsections.

Response 15: Thank you for your valuable comment. In order to make manuscripts to be better presented with precise and logical flow, we reorganize and divide the discussion into several subsections based on the reviewer's suggestion (Please see line 350–420 on page 16–19).

Point 16. "Indonesia has a diverse culture and extremely unique spiritual belief…." Is it possible the data could be biased because of such extreme heterogeneity? If yes, how did author overcome this? Where are the underlying data? Otherwise the reasons are stated, the journal requires the publication of underlying data.

Response 16: We appreciate your insightful comments. The Daily Spiritual Experiences Scale (DSES) questionnaire is often used in epidemiological research, and people of different religions, cultures, and traditions have been suggested as a reason why.

The DSES instrument (Underwood and Teresi 2002; Underwood 2006) was designed on the basis of extensive research involving analysis of sources from theology, religion, and social sciences, investigation of spirituality measurements, in-depth interviews and focus groups with people from different religions, cultures, traditions. The DSES instrument was developed to assess the daily frequency of specific experiences of spirituality and interaction with transcendence. Items are designed to measure spiritual experience, not beliefs or behavior based on religious and spiritual doctrines. Spiritual experiences may be evoked by a religious context or by daily events, individual religion or religious or spiritual beliefs. Moreover, The DSES is composed of various concepts: transcendent connection, the support provided by God,

divine or transcendent, inner peace and harmony, interconnectedness with all living things, reverence for beauty, gratitude, compassion, mercy, and the desire to be closer to God.

The tool is validated in many languages, widely used and applicable to people with different religious traditions or atheists or agnostics (Underwood 2006; Ellison and Fan 2008; Kalkstein and Tower 2009; Ng et al. 2009; Bailly and Roussiau 2010; Sánchez et al. 2010; Underwood 2011; Loustalot et al. 2011; Kimura et al. 2012; Rakošec et al. 2015; Lo et al. 2016).

thank you

Response to Reviewer 3 Comments

Dear Reviewer #3,

Thank you for considering our manuscript and for the valuable suggestions, also the opportunity to resubmit a revised manuscript, which helps us to improve the article. We carefully revised the manuscript in accordance with your comments. The revised sections of the manuscript are marked with red color. Our point-by-point responses to the comments are as follows. We very much hope the revised manuscript is accepted for publication in PLOS ONE. Thank you very much for your consideration.

Point 1. The title should be changed since this study was a cross sectional study therefore it is not possible to measure the impact or effect and it is advised to change the titled to the relationship rather than measuring the effect

Response 1: Thank you for your valuable comment and suggestion. We re-word “The effect” to “Relationship” based on the reviewer’s suggestion in the title section.

"Relationship of spirituality, health engagement, health belief and attitudes toward acceptance and willingness to pay for a COVID-19 vaccine"

Point 2. Research objectives are not clearly stated in the introduction section and that way it is advised to revise and mention about related research objective

Response 2: Thank you for your valuable comment and suggestion. In order to make manuscripts to be better presented with precise and logical flow, we organize the research objective based on the reviewer's suggestion as follows;

"To fill these gaps, this study explored how Indonesians accepted the COVID-19 vaccine and their willingness to pay for it. This was accomplished by surveying their spirituality, HE, HBM constructs, and AVs" (Please see line 116–118 on page 5).

Point 3. it is required to provide scientifically calculation for sample size for the study

Response 3: Thank you for your valuable comment. In this revised manuscript, we added a sample size calculation based on reviewer's suggestion as follows;

"Sample size was estimated based on previous study [36] with the formula; $n = u_a p\ (1 - p)/\delta^2$, where n = minimum desired sample size, u_a = the standard normal deviation, usually set as 1.96 which corresponds to 5% level of significance. p = the average rate of acceptance of vaccine was estimated on the basis of the available literature and its value was set at 85% [37], δ = of precision set at 0.015. The calculated minimum sample size was 1,111 (n = 1.96 x 0.85 x (1-0.85)/0.015^2 = 1,111). We expected a potential missing data of 20% with a large population and thus aimed to recruit at least 1,388 participants. Finally, during one-month data collection, the total sample consisted of 1,423 Indonesian citizens." (Please see line 232–239 on page 10).

Point 4. data collection procedures should be explained in details and it is not clear what does it mean researchers technological and personal networks please elaborate more on this section

Response 4: Thank you for your valuable comments and suggestions. In order to make manuscripts to be better presented with precise and detail, we reorganize the data collection procedures based on the reviewer's suggestion as follows;

"The online survey was distributed using a Google Form link that was shared on social media platforms including WhatsApp, Instagram, Telegram, and Facebook. Furthermore, this relies on researchers' technical and personal networks and engaging with and distributing the survey through social media influencers and community leaders. Participants were selected for the study using a simplified snowball sampling technique, and they were asked to forward the invitation to their contacts; the estimated completion time for the survey was 15 minutes. We conducted different procedures to target as many respondents as possible from across the region during the December 15, 2020 to January 12, 2021 data collection period. Finally, 1,423 people responded to our Google form" (Please see line 131–140 on page 6)

"The Google Form link had four sections. (1) Before allowing participants to proceed to the survey questions, the first section informed them of the objective of the study and eligibility requirements. Furthermore, the informed consent was taken by checking the box "Agree," which was required to confirm that they understood the authorization information and met the inclusion and exclusion criteria. Additionally, participants decided to participate voluntarily and with the freedom to withdraw at any time; (2) Second section comprised questions correlated to sociodemographic; (3) Third section comprised questions that assessed the intention to accept being vaccinated and willingness to pay for vaccinated; (4) Fourth section contained 35 questions including HE, AVs, HBM, and spirituality questionnaire. Finally, a

page at the end expressed our gratitude, and all individuals who completed the survey were encouraged to persuade new respondents from their contact lists to participate by forwarding the link to the online survey" (Please see line 141–152 on page 6)

Point 5. Most of explanation on their data collection procedures is related to explaining different section of the questionnaire rather than the process of data collection

Response 5: Thank you for your valuable comments and suggestions. In order to make manuscripts to be better presented with precise and detail, we reorganize the data collection procedures based on the reviewer's suggestion as follows;

"The online survey was distributed using a Google Form link that was shared on social media platforms including WhatsApp, Instagram, Telegram, and Facebook. Furthermore, this relies on researchers' technical and personal networks and engaging with and distributing the survey through social media influencers and community leaders. Participants were selected for the study using a simplified snowball sampling technique, and they were asked to forward the invitation to their contacts; the estimated completion time for the survey was 15 minutes. We conducted different procedures to target as many respondents as possible from across the region during the December 15, 2020 to January 12, 2021 data collection period. Finally, 1,423 people responded to our Google form" (Please see line 131–140 on page 6)

"The Google Form link had four sections. (1) Before allowing participants to proceed to the survey questions, the first section informed them of the objective of the study and eligibility requirements. Furthermore, the informed consent was taken by checking the box "Agree," which was required to confirm that they understood the authorization information and met the inclusion and exclusion criteria. Additionally, participants decided to participate voluntarily and with the freedom to withdraw at any time; (2) Second section comprised questions

correlated to sociodemographic; (3) Third section comprised questions that assessed the intention to accept being vaccinated and willingness to pay for vaccinated; (4) Fourth section contained 35 questions including HE, AVs, HBM, and spirituality questionnaire. Finally, a page at the end expressed our gratitude, and all individuals who completed the survey were encouraged to persuade new respondents from their contact lists to participate by forwarding the link to the online survey" (Please see line 141–152 on page 6)

Point 6. It is not mention about the process of translation since the original question are were in English the process of cross-cultural adaptation should be explained in details like forward backward translation cognitive debriefing

Response 6: Thank you for your valuable comment and suggestion. In this revised manuscript, we added a description to make a clear the process of cross-cultural adaptation based on the reviewer's suggestion as follows;

"In the present study, the questionnaires including HE, AVs, and HBM were assessed for the translation process. After obtaining approval from the original authors, the questionnaires (HE, AVs, and HBM) were independently translated into Indonesian using the forward and back-translation methods. The questionnaires were translated by five translators, a certified translator and four experts in nursing research in Indonesian universities, whose native language was Indonesian and who were bilingual and fluent in English. The translators were assessing the questionnaire items to be relevant to measure the HE, AVs, and HBM toward acceptance and willingness to pay a COVID-19 vaccination precisely for linguistic and conceptual equivalence. In brief, Indonesian-speaking academics were first contacted to review the translated version for grammatical accuracy and clarity. Thus, four independent bilingual translators completed the back translation of the Bahasa edition into English. In addition, the final Bahasa version was obtained by comparing the original questionnaire with

its back translation. Translators were instructed to avoid metaphors, colloquial terminology, and hypothetical statements, and to use simple sentences. Initially, prior to completing the formal online survey, we conducted a pilot study with 60 residents in the close surroundings of the researchers to determine the questionnaire's readability and reliability". Further, we reviewed cognitive debriefing results and the finalized version with content validity index (CVI) and kappa (*k**). Finally, we conducted an analysis of the reliability and validity with Kaiser-Meyer-Olkin (KMO) test, the Bartlett's test of sphericity value, a Cronbach's alpha and item-total correlation coefficient" (Please see line 175–194 on page 7–8).

Point 7. It is required to mention about the scoring of all instruments

Response 7: Thank you for your valuable comment and suggestion. In this revised manuscript, we mention the scoring of all instruments based on the reviewer's suggestion.

"The total score ranges from 1 to 5, a higher score indicated a more-favorable attitude to acceptance a COVID-19 vaccine" (Please see line 161–162 on page 7).

"The total score ranges from 1 to 5, the higher the score an individual has, the greater their willingness to pay for a vaccine" (Please see line 166–167 on page 7).

"The total score ranges from 16 to 96, the greater the number of experiences points a person has, the greater their spirituality. Participants' overall spirituality was categorized, as high if the score was ≥ 72, and low if the score was <72 [7]" (Please see line 172–174 on page 7).

"The total score ranges from 6 to 30, a greater value indicating greater HE [24]. Interestingly, we defined HE score with response as continuous data on five-point Likert scale; 1 (definitely disagree) to 5 (strongly agree). Also, we defined HE scores as categorical data for disagreement

(definitely disagree/disagree/strongly disagree) and agreement (agree/strongly agree) presented in S1 Table″ (Please see line 196–200 on page 8).

"The total score ranges from 2 to 10, a greater value indicating greater AVs. For our study analysis, we defined AVs score with response as continuous (total score). Also, we defined VAs scores involving the agreement (strongly agree/agree), and disagreement (neither agree nor disagree, strongly disagree/disagree) presented in S1 Table″ (Please see line 206–210 on page 9).

"Response this statement was ranked on a 7-point Likert-scale; 1 (strongly disagree) to 7 (strongly agree) [35]. Also, HBM constructs were used in COVID-19 vaccinations previous research [9, 32]. The total score ranges from 12 to 84, a higher score indicates a good health belief, except for the PBA construct. In the present study, we defined HBM score with response as continuous data or total score in each construct. Moreover, the detailed HBM constructs score involve the agreement (somewhat agree/agree/strongly agree), and disagreement (somewhat disagree/disagree/ strongly disagree /neither agree nor disagree) presented in S2 Table″ (Please see line 219–225 on page 9).

Point 8. Results of face and content validity should be elaborated by using content validity index and Kappa

Response 8: Thank you for your valuable comment and suggestion. We added a kappa results to make a clear the results of face and content validity based on the reviewer's suggestion as follows;

"HE questionnaire English was translated into Indonesian and had a CVI of 0.93, *k** of 0.94 to 1" (Please see line 200-201 on page 8).

"The Indonesian version of the VAs questionnaire had an acceptable CVI 0.95 with *k** of 0.98 to 1" (Please see line 212-213 on page 9).

"The questionnaire of the HBM Indonesian version presented that the CVI was 0.95 with *k** of 0.89 to 0.92" (Please see line 226–227 on page 9).

Point 9. For the reliability analysis reporting only Alpha Cronbach is not adequate and it is advice also to mention about the total item correlation for each indicator

Response 9: Thank you for your valuable comment and suggestion. In this revised manuscript, we added a description to make a clear the reliability analysis report based on the reviewer's suggestion as follows;

HE questionnaire: "the value of the KMO test was 0.72 and the Bartlett's test of sphericity value was significant (p < 0,001). Furthermore, a Cronbach's alpha of 0.91 with item-total correlation coefficient score was 0.68 to 0.88" (Please see line 201–204 on page 8).

AVs questionnaire: "The value of KMO test was 0.59 and the Bartlett's test of sphericity value was significant (p < 0,001). Furthermore, a total Cronbach's alpha of 0.70 with item-total correlation coefficient score was 0.60 and 0.68 in our study" (Please see line 213–216 on page 9).

HBM questionnaire: "The value of KMO test was 0.61 and the Bartlett's test of sphericity value was significant (p < 0,001). Furthermore, the total Cronbach's alpha of 0.81 with item-total correlation coefficient score was 0.63 to 0.71" (Please see line 227–229 on page 9).

Point 10. What is "AVs uses "in page 9

Response 10: Thank you for your valuable comment. We revised "AVs uses" to "Vaccine attitudes (AVs) consists of…" (Please see line 205 on page 9).

Point 11. Since in this study parametric tests were applied, it is required to mention about the normality test of distribution for all research variables.

Response 11: Thank you for your valuable comment. In this revised manuscript, we added the normality test of distribution for all research variables through skewness and kurtosis test based on the reviewer's suggestion as follows;

"Absolute values for skewness and kurtosis were used to assess normality of the data; skewness value of -0.264 and kurtosis value of 1.677 indicated a normal distribution [40]" (Please see line 254–256 on page 10-11).

References: Kim H-Y. Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. Restorative dentistry & endodontics. 2013;38(1):52-4. https://doi.org/10.5395/rde.2013.38.1.52

Point 12. The assumption of the homogeneity of variance for ANOVA also need to be reported

Response 12: Thank you for your valuable comment and suggestion. We used the assumption of the homogeneity regarding previous references from Kim, 2013.

"For sample sizes greater than 300, depend on the histograms and the absolute values of skewness and kurtosis without considering z-values. Either an absolute skewness value larger than 2 or an absolute kurtosis (proper) larger than 7 may be used as reference values for determining substantial non-normality"

References: Kim H-Y. Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. Restorative dentistry & endodontics. 2013;38(1):52-4. https://doi.org/10.5395/rde.2013.38.1.52

Point 13. In Table 1 comparison between geographical region was done using one-way ANOVA since the sample size or not equal for western eastern and central regions therefore it is advised to use Kruskal Wallis test rather than one-way ANOVA

Response 13: Thank you for your valuable comment and suggestion. In this revised manuscript, we added the normality test of distribution based on the reviewer's suggestion as follows;

"Absolute values for skewness and kurtosis were used to assess normality of the data; skewness value of -0.264 and kurtosis value of 1.677 indicated a normal distribution [40]" (Please see line 254–256 on page 10-11). Thus, we use one-way ANOVA in Table 1 (comparison between geographical region).

References: Kim H. Y. (2013). Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restorative dentistry & endodontics*, *38*(1), 52–54. https://doi.org/10.5395/rde.2013.38.1.52

Point 14. Since this study used and non-random sampling therefore the P value for interpretation of the results is not applicable therefore it is advised to discuss and interpret defining based on the effect size rather than P value

Response 14: Thank you for your valuable comment and suggestion. We deleted the P value based on the reviewer's suggestion.

We presented the adjusted beta coefficients (β) with 95% confidence intervals (CIs) to interpret defining based on the effect size rather than P value (Please see results section table 3 explanation; line 306 –309 on page 14).

Point 15. In Table 2 and 3 comparing between disagree/ agree for each indicator was done, which is not required to do the comparison based on indicators. it is advised to concentrate on the overall score of a scale and its association with willingness and also acceptance

Response 15: Thank you for your valuable comments and suggestions. In order to make manuscripts better presented, we reorganize data Tables 2 and 3 become Table 2 with the overall score of a scale. Tables 4 and 5 become Table 3. However, we presented all indicator's data in a supplementary file based on the reviewer's suggestion (Please see results sections; line 350–420on page 16–19).

Point 16. Multiple linear regression analysis should be based on the total score of the components rather than including all indicators in the questionnaire as predictors therefore it is recommended to revise and redo the analysis for multiple linear regression based on the total score of all predictors in one model

Response 16: Thank you for your valuable comments and suggestions. In order to make manuscripts better presented, we reorganize data and redo the analysis. Data in tables 4 and 5 become table 3 with the overall score of a scale. However, we presented all the indicator's data in a supplementary file based on the reviewer's suggestion Please see results section table 3 explanation; line 306 –309 on page 14).

thank you