Health Literacy, eHealth Literacy, Adherence to Infection Prevention and Control, Lifestyle Changes, Suspected COVID-19 Symptoms among Health Care Workers: An Online Survey During the Lockdown

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Abstract

Background: Coronavirus disease (COVID-19) pandemic creates a heavy burden on healthcare systems and governments. Health literacy (HL) and eHealth literacy (eHEAL) are recognized as strategic public health elements but underestimated during the pandemic. HL, eHEAL, practices, lifestyles, and health status of health care workers (HCWs) play crucial roles in containing

the COVID-19 pandemic.

Objective: To evaluate psychometric properties of the eHEAL scale, and examine associations of HL and eHEAL with adherence to infection prevention and control procedures (AIPC), lifestyle changes, and suspected COVID symptoms (S-COVID-19-S) among HCWs during the lockdown.

Methods: We conducted an online survey on 5209 HCWs from 15 hospitals and health centers across Vietnam from 6th to 19th April 2020. HCWs were asked about their socio-demographics; HL; eHEAL; AIPC; changes in dietary intake, smoking, drinking, physical activity; and S-COVID-19-S. Principal component analysis, correlation analysis, bivariate, and multivariate linear and logistic regression models were utilized to validate eHEAL scale and examine the associations.

Results: The eHEAL was found with a good construct validity with eight items highly loaded on one component with factor loadings rank from .78 to .92, explained 76.34% of variance; satisfactory criterion validity as correlated with HL (rho=.42); good convergent validity with high item-scale correlations (rho=.80-.84); high internal consistency (Cronbach ?=.95). HL and eHEAL were significantly higher in men (unstandardized coefficient, B 1.01, 95% confidence interval, 95% CI 0.57 to 1.45, P<.001; B 0.72, 95% CI 0.43 to 1.00, P<.001), better ability to pay for medication (B 1.65, 95%CI 1.25 to 2.05, P<.001; B 0.60, 95%CI 0.34 to 0.86, P<.001), being doctors (B 1.29, 95%CI 0.73 to 1.84, P < .001; B 0.56, 95%CI 0.20 to 0.93, P=.003), having epidemic containment experiences (B 1.96, 95%CI 1.56 to 2.37, P<.001; B 0.64, 95%CI 0.38 to 0.91, P<.001), as compared to their counterpart, respectively. HCWs with higher HL score, or higher eHEAL score had better AIPC (B 0.13, 95%CI 0.10 to 0.15, P<.001; or B 0.22, 95%CI 0.19 to 0.26, P<.001), higher likelihood of healthy eating (odds ratio, OR 1.04, 95%CI 1.01-1.06, P=.001; or OR 1.04, 95%CI 1.02-1.07, P=.002), and doing more physical activity (OR 1.03, 95%CI 1.02-1.03, P<.001; or OR 1.04, 95%CI 1.03-1.05, P<.001), and lower likelihood of having S-COVID-19-S (OR 0.97, 95%CI 0.96-0.98, P<.001, or OR 0.96, 95%CI 0.95-0.98, P<.001), respectively.

Conclusions: The eHEAL is a valid and reliable survey tool. Gender, ability to pay for medication, type of healthcare personnel, and epidemic containment experience are independent predictors of HL and eHEAL. HCWs with higher HL score or eHEAL score had better AIPC, healthier lifestyles, and lower S-COVID-19-S likelihood. Efforts to improve HCWs' HL and eHEAL can help to contain the COVID-19 pandemic and its consequences.

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Abstract

Background: Coronavirus disease (COVID-19) pandemic creates a heavy burden on healthcare systems and governments. Health literacy (HL) and eHealth literacy (eHEAL) are recognized as strategic public health elements but underestimated during the pandemic. HL, eHEAL, practices, lifestyles, and health status of health care workers (HCWs) play crucial roles in containing the COVID-19 pandemic.

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Conclusions: The eHEAL is a valid and reliable survey tool. Gender, ability to pay for medication, type of healthcare personnel, and epidemic containment experience are independent predictors of HL and eHEAL. HCWs with higher HL score or eHEAL score had better AIPC, healthier lifestyles, and lower S-COVID-19-S likelihood. Efforts to improve HCWs' HL and eHEAL can help to contain the COVID-19 pandemic and its consequences.

KEYWORDS

COVID-19; health literacy; e-health literacy; health care workers; personal protective equipment; handwashing; masks; disposing; lifestyles; Vietnam.

Introduction

The coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which sets the whole world in unprecedented challenges [1-6], with a huge socio-economic burden [7], morbidity, and mortality [8,9]. It is required the multidisciplinary and multidimensional approaches to contain the pandemic [10-12]. Social and behavioral changes [13,14], improving health literacy (HL) [15] and eHealth literacy (eHEAL) [16] are highly recommended to control the massive global health crisis while effective treatments and vaccines are unavailable.

The lockdown measure was applied in many countries and Vietnam [17]. It is a necessary public health approach to contain the infection. During the lockdown period, health care workers still have to work and provide health services to patients. They are more vulnerable to coronavirus infection. In addition, the pandemic itself and the social distancing measure have negative impacts on psychological health [18,19], health-related behavior changes [20-23].

In the time of COVID-19 pandemic, online consultations from hospitals and health care centers were found to be safe, effective services to reduce the negative effects of the pandemic [24]. In addition, social media can provide insights for effective communications among public health authorities [25], to researchers [26], and to the public [27-29]. However, social media spreads panic and anxiety to the public [30]. Disinformation and misinformation have been raising as highly concerning issues for the public [31-33]. Health literacy plays an important role in evaluating online health information [34]. The HL skill is critical for people who live in the digital world with diverse information and sources [35], especially during the COVID-19 pandemic. Therefore, health care workers (HCWs) play an important role to support the public to combat the misinformation [27,36], even though the social media network cannot alter the HCWs' consultations [36,37]. The continuous training and educations to improve the HL of HCWs have been recognized as an effective approach to improve the healthcare delivery [38,39], and communication [38,40,41], shared decision-making [42], and patients' health outcomes [39]. Furthermore, raising the awareness of the behavioral pitfalls could help with appropriate behavioral changes and crisis containment [43]. Health literacy and eHealth literacy are more important than ever during the COVID-19 pandemic [16,44]. However, it is an underestimated issue during the pandemic [15].

We aimed to evaluate the psychometric properties of eHEAL scale, and examine the predictors of HL and eHEAL. We also examined the associations between HL, eHEAL with adherence to infection prevention and control measures (AIPC), lifestyle changes, and suspected COVID-19 symptoms (S-COVID-19-S) among HCWs during the lockdown period in Vietnam.

Methods

Study Design and Settings

A cross-sectional study was conducted on health care workers (HCWs) from 6th to 19th April 2020 using online-based questionnaires (see Text S1 in Multimedia Appendix 1). The HCWs were recruited from 12 hospitals and three health centers across Vietnam, including 8 hospitals in the

North, one hospital, and one health center in the Center, three hospitals, and two health centers in the South.

Study Participants and Data Collection

All the HCWs (doctors and nurses) in our study were those who had not provided any direct care or contacted with COVID-19 patients. A total sample of 5209 HCWs who completed the surveys, including 177 from Military Hospital 103, 335 from E hospital, 424 General Hospital of Agricultural, in Hanoi; 988 from Thai Nguyen National Hospital, in Thai Nguyen Province; 364 from Bac Ninh Obstetrics and Pediatrics Hospital, in Bac Ninh city; 675 from Quang Ninh General Hospital, 476 from Bai Chay Hospital, 290 from Quang Ninh Obstetrics and Pediatrics Hospital, in Quang Ninh province; 203 Trieu Phong District Health Center, Quang Tri province; 134 from Danang Oncology Hospital, in Da Nang city; 241 Tan Phu District Hospital, 318 from Hospital District 2, 102 from District 9 Health Center, 291 from Thu Duc District Health Center, in Ho Chi Minh city; and 191 from Can Tho University Of Medicine and Pharmacy Hospital, in Can Tho city.

Vietnam applied the nationwide lockdown measure from 1st to 15th of April [17] and extended the measure to 22nd of April 2020 [45,46]. Therefore, all HCWs in this study took the online survey during the lockdown period. The online survey links were sent to HCWs via Email, or Messenger, or Zalo. The QR codes were also displayed in different departments of hospitals and health centers. It took about 10-15 minutes to complete the survey questionnaires. The mandatory field was applied for all survey questions. Therefore, there is no missing data in our study. Finally, the data was coded, cleaned, and analyzed by researchers confidentially.

Measures

Socio-demographics

Health care workers were asked about their age (21-40 vs. 41-60 years), gender (women vs. men), marital status (never married vs. ever married), ability to pay for medication (very or fairly difficult vs. very or fairly easy), social status (low vs. middle to high), types of health care personnel (doctors, nurses, or others), types of health care facility (second line vs. front line: outpatient department, emergency department, quarantine, isolation areas, medical imaging and laboratory diagnosis department, patient administration areas), and previous epidemic (e.g. SARS, Tuberculosis, influenza A) containment experiences (no vs. yes). Additionally, the comorbidity was assessed using the items of the Charlson comorbidity index [47,48].

Health Literacy

The 12 items short-form health literacy questionnaire (HLS-SF12) were used. The questionnaire was validated and used in Asian countries,[49] and Vietnam [50-53]. HCWs rated their perceived difficulty of items based on a 4-point Likert scale from 1= “very difficult”, to 4= “very easy”. The health literacy index score was standardized to an unified metric from 0 to 50, with a higher score presenting better health literacy [49,54].

eHealth Literacy

The eHealth literacy scale (eHEAL) with 8 items was used to assess HCWs’ eHealth literacy skill which was widely used [55]. The questionnaire was translated into Vietnamese by researchers. The

content was then validated by an expert panel (28 medical doctors, seven nurses, nine nutrition, and public health professionals). The expert panel suggested to remain the original rating and scoring. HCWs were asked to rate their experiences using the Internet for health information based on a 5-points Likert scale from 1= “strongly disagree”, to 5= “strongly agree”. The score ranges from 8 to 40 with the high eHEAL score the better eHealth literacy.

Adherence to Infection Prevention and Control Procedures

HCWs were asked about the practice and activities performed on COVID-19 infection prevention and control (IPC) during the health care interactions. The questionnaire was adapted from the interim guidance of the World Health Organization [56]. The IPC measures were wearing personal protective equipment (PPE) (e.g. (1) single-used gloves, (2) medical mask, (3) face shield or goggles/protective glasses, (4) disposable gown); (5) remove and replace the PPE according to protocol; perform hand hygiene (e.g. (6) before and after touching patients, (7) before and after performing any clean or aseptic procedure, (8) after exposure to body fluid, (9) after touching patients’ surroundings); (10) decontaminate high-touch surfaces. HCWs were asked to quantify the frequency with which they performed the IPC procedures, as recommended from 0=never, 1= rarely (less than 20% of the time), 2= occasionally (20% to under 50% of the time), 3= most of the time (50% under 95% of the time), 4= always (≥ 95% of the time). The total score of above 10 performances ranks from 0 to 40, with the higher score, the better adherence to IPC (AIPC) procedures.

Lifestyle Changes

HCWs were asked about the current status of smoking (never/stopped/less vs. unchanged or more), drinking (never/stopped/less vs. unchanged or more), physical activities (never/stopped/less vs. unchanged or more), and eating behavior (less healthy vs. unchanged or healthier), as compared with that before the pandemic [53].

Suspected COVID-19 Symptoms

HCWs then were screened for the suspected COVID-19 symptoms (S-COVID-19-S) [57]: e.g., common symptoms (fever, cough, dyspnea), and less common symptoms (myalgia, fatigue, sputum production, confusion, headache, sore throat, rhinorrhea, chest pain, hemoptysis, diarrhea, and nausea/vomiting). HCWs with any of those symptoms were classified as having S-COVID-19-S.

Ethical Consideration

The study was reviewed and approved by the Institutional Ethical Review Committee of Hanoi School of Public Health, Vietnam (IRB No. 133/2020/YTCC-HD3). The HCWs voluntarily took the survey.

Data analysis

Psychometric Properties of the eHEAL

Construct validity: The construct of eHEAL was examined using the principal component analysis (PCA). The Kaiser-Meyer Olkin value (KMO) ≥ 0.6 was set for measure of sampling adequacy), and Bartlett’s Test of Sphericity value < 0.05 were set to determine the suitability of the data for PCA [58]. The oblique rotation (Promax) method was utilized.

Convergent validity: The Spearman's correlation was used to check the correlations between the eHEAL scale and its eight items.

Criterion validity: The Pearson correlation between eHEAL and HLS-SF12 was estimated. This was to provide evidence of criterion validity [59].

Floor and ceiling effects: The percentages of possibly lowest score and highest score among HCWs were calculated. The minimal percentages (< 15%) were recommended to eliminate the floor and ceiling effects [60].

Reliability analysis: The internal consistency of eHEAL was examined using Cronbach's alpha test. The value of Cronbach's alpha ≥ 0.70 was designated for satisfactory reliability [61].

Health Literacy, eHealth Literacy, and Associated Factors

The distributions of HL, eHEAL in different categories of studied variables were explored using one-way ANOVA test. In addition, the bivariate and multivariate linear regression models were utilized to examine the predictors of HL, eHEAL, to investigate the association between HL, eHEAL, and AIPC. Next, the bivariate and multivariate logistic regression models were used to examine the associations of HL, eHEAL with lifestyle changes, and S-COVID-19-S. The factors demonstrated the associations with outcome variables at *P* value < .20 in bivariate models were included in multivariate models [62]. In order to exclude the colliders which may cause multicollinearity, we checked the correlations between them using Spearman's correlation test. The representative factors were selected in the multivariate analysis. The regression coefficient (B), odds ratio (OR), and 95% confidence interval (95%CI) were reported appropriately.

Data were analyzed using the IBM SPSS Version 20.0 (IBM Corp, Armonk, NY, USA). The significance level was set at a *P* value < .05.

Results

Characteristics of Health Care Workers

Table 1 indicates that, of 5209 HCWs, 905 (17.4%) were aged 41-60 years, 1714 (32.9%) were men, 769 (14.8%) were with S-COVID-19-S, 5042 (96.8%) ate at "unchanged or healthier" level, 228 (4.4%) smoked at "unchanged or more" level, 234 (4.5%) drunk at "unchanged or more" level, 3553 (68.2%) had physical activity at "unchanged or more" level during the pandemic. The mean (SD) of adherence to infection prevention and control (AIPC), health literacy (HL), e-health literacy (eHEAL) were 30.6 (6.2), 36.2 (7.3), 33.1 (4.8), respectively. The distribution of HL was varied by different categories of age, gender, ability to pay for medication, social status, type of health care personnel, epidemic containment experience, body mass index (BMI), with S-COVID-19-S, dietary intake, smoking, physical activity (*P*<.05). The distribution of eHEAL was varied by different categories of gender, the ability to pay for medication, type of health care personnel, epidemic containment experience, BMI, with S-COVID-19-S, dietary intake, smoking, physical activity (see Table 1).

Psychometric Properties of eHealth Literacy

In Table 2, the KMO value of the overall scale was 0.93, and of its items were from 0.92 to 0.95. Bartlett's Test of Sphericity value was less than .001 which was at a satisfactory level. Besides, the average communality value of 0.76 was at an adequate level, demonstrating the accuracy of the approach [63]. Eight items of eHEAL were strongly loaded on one component which explained 76.34% of the scale variance. The factor loading values of eight items were ranked from .78 to .92 as shown in Table 2. The correlations between each item and the scale range from .80 to .84, indicating satisfactory convergent validity [49,50]. In addition, the correlation between eHEAL and HL was at a moderate level with rho=.47, providing evidence of criterion validity [59]. Furthermore, the Cronbach's alpha value of 0.95 was at a high level of the internal consistency. There was no significant floor effect with 0.7% at the lowest potential response. The marginal ceiling effect was found with 16.1% at the highest potential response which was slightly higher than 15% (Table 2).

Determinants of Health Literacy and eHealth Literacy

The correlations among the independent variables were at a weak level that no collider existed in the analysis (see Table S1 in Multimedia Appendix 1). The results of the multivariate analysis shown in Table 3 indicates that HCWs with higher HL were men (unstandardized coefficient, B 1.01, 95% confidence interval, 95% CI 0.57 to 1.45, $P < .001$), those with very or fairly easy ability to pay for medication (B 1.65, 95%CI 1.25 to 2.05, $P < .001$), with middle or high social status (B 0.586, 95%CI 0.003 to 1.169, $P = .049$), being doctors (B 1.29, 95%CI 0.73 to 1.84, $P < .001$), and having epidemic containment experience (B 1.96, 95%CI 1.56 to 2.37, $P < .001$), as compared to their counterpart, respectively.

HCWs with higher eHEAL were men (B 0.72, 95% CI 0.43 to 1.00, $P < .001$), those with very or fairly easy ability to pay for medication (B 0.60, 95%CI 0.34 to 0.86, $P < .001$), being doctor (B 0.56, 95%CI 0.20 to 0.93, $P = .003$), and having epidemic containment experience (B 0.64, 95%CI 0.38 to 0.91, $P < .001$), as compared to their counterpart, respectively (see results of multivariate model in Table 3).

Association between Health Literacy and eHealth Literacy and Adherence to Infection Prevention and Control

According to results of multivariate linear regression analysis shown in Table 4, higher HL (B 0.13, 95%CI 0.10 to 0.15, $P < .001$), and higher eHEAL (B 0.22, 95%CI 0.19 to 0.26, $P < .001$) was found to be associated with better AIPC, after adjusted for age, gender, ability to pay for medication, social status, type of healthcare personnel, type of healthcare facility, epidemic containment experience, and comorbidity. These adjusted factors showed the associations with AIPC at $P < .2$ (see Table S2 in Multimedia Appendix 1).

Association between Health Literacy and eHealth Literacy and Lifestyle Changes

The results of multivariate logistic regression analysis shown in Table 4 indicate that HCWs with higher HL (odds ratio, OR 1.04, 95%CI 1.01-1.06, $P = .001$), and higher eHEAL (OR 1.04, 95%CI 1.02-1.07, $P = .002$) had a higher likelihood of eating at "unchanged or healthier" level, after adjusted for age, gender, marital status, ability to pay for medication, and social status. These

adjusted factors showed the associations with eating behavior changes at $P < .2$ (see Table S2 in Multimedia Appendix 1). In addition, HCWs with higher HL (OR 1.03, 95%CI 1.02-1.03, $P < .001$), and higher eHEAL (OR 1.04, 95%CI 1.03-1.05, $P < .001$) had a higher likelihood of doing physical activity at "unchanged or more" level, after adjusted for age, gender, ability to pay for medication, social status, type of healthcare personnel, type of healthcare facility, and epidemic containment experience. These adjusted factors showed the associations with physical activity at $P < .2$ (see Table S2 in Multimedia Appendix 1). No association was found between HL, eHEAL with smoking, or drinking behaviors.

Association between Health Literacy and eHealth Literacy and S-COVID-19-S

As shown in Table 4, HCWs with higher HL (OR 0.97, 95%CI 0.96-0.98, $P < .001$), and health eHEAL (OR 0.96, 95%CI 0.95-0.98, $P < .001$) had a lower likelihood of having S-COVID-19-S, after adjusted for age, gender, marital status, ability to pay for medication, social status, type of health care personnel, and comorbidity. These adjusted factors showed the associations with S-COVID-19-S at $P < .2$ (see Table S2 in Multimedia Appendix 1).

Discussion

The e-health literacy (eHEAL) questionnaire was found to be valid and reliable for assessing eHealth literacy of HCWs. The tool is shown with satisfactory construct validity, convergent validity, criterion validity, and reliability. There is no flooring effect. The marginal ceiling effect was found. The survey was conducted on HCWs who recognized as the group with a higher standard of health knowledge and skills. Therefore, it is reasonable that more participants had a higher or maximum score.

The male HCWs had higher HL and eHEAL that was found in the current study. The finding is inconsistent with a previous study conducted in general populations in Europe [64] in which men had lower HL than women. Another study conducted in a general population in Taiwan showed that men had lower HL and e-healthy diet literacy than women [65]. EHealth literacy was also found to be higher in women than men in the general population in Hungary [66], in healthcare professionals in Ethiopia [67].

Health care workers with better ability to pay for medication had higher HL levels and eHEAL level. The positive association between the ability to pay for medication was prominently found in many previous studies [50,51,65,68,69]. In addition, HCWs with middle or high social status had higher HL levels. This was similar to the finding of previous studies conducted in Asia [50,51,65,68-70], and Europe [64].

Doctors had higher HL and eHEAL than other HCWs. Similarly, HCWs with epidemic containment experiences had higher HL and eHEAL in the current study. Among HCWs, doctors had received longer professional training, they have been recognized as the group with higher level of ability to find, understand, justify, and use health-related information. They also involved in educating and counseling other HCWs and patients [71]. In addition, those HCWs had involved in containing the previous outbreaks or epidemics, logically had better health knowledge and skills that made their HL and eHEAL higher. Health literacy was found as a strategic approach to improve patients-HCWs

communication [40] which might contribute to contain the pandemic and its consequences [44].

In the current study, HCWs with higher score of HL or eHEAL had better adherence to IPC. This is the first study investigating these associations. In the literature, higher HL was found to be associated with better adherence to therapies in people with chronic diseases [72-75]. In the time of the pandemic, receiving COVID-19-related information online could be beneficial for various preventive behaviors [76]. Therefore, more effort is needed to increase accurate information and encourage appropriate behaviors [77]. Given that, HCWs should highly be aware and strictly adhere to the guidelines for infection prevention and control, to contain the COVID-19 pandemic.

Our study found that HCWs with a higher score of HL and eHEAL score had a lower likelihood of S-COVID-19-S. It has been noted that individuals with a higher HL score had a better health status [69,78], and well-being [79,80]. This could be further explained that HL and eHEAL associated with healthier eating and physical activity behaviors in the current study. eHealth literacy was found to be associated with key issues related to seeking out for exercise regime information, maintaining the healthy diet [81]. In addition, it has been reported that people with a higher score of HL had healthier behaviors (e.g. exercise, balanced diet) [65,82], which further contribute to protect and improve their health and well-being [83].

The current study has some limitations. Firstly, the study was conducted online, the S-COVID-19-S was self-reported which we cannot confirm the cases and exclude them from our study. Fortunately, there was no new confirmed case in the study settings during the data collection period [84]. Secondly, a cross-sectional design was utilized which cannot provide evidence of the causal relationships among studied variables. However, we have surveyed a relatively large sample of HCWs from 15 hospitals and health centers across Vietnam which can help with exploring the associations and phenomenon for future research, and the evidence for potential interventions.

Conclusions

The eHEAL questionnaire is a valid and reliable questionnaire for assessing eHealth literacy among health care workers. Health literacy and eHealth literacy were significantly higher in those who are men, with better ability to pay for medication, being doctors, and having previous epidemic containment experiences. Both health literacy and eHealth literacy were associated with better adherence to infection prevention and control procedures, healthier lifestyles (e.g. had healthier eating behavior, more physical activities during the pandemic), and a lower likelihood of having S-COVID-19-S. The integrative and multidisciplinary approaches are required to improve health care workers' health literacy and eHealth literacy which could help with improving the adherence to infection prevention and control measures, promoting healthy behaviors, and protecting the health of health care workers. This further contributes to contain the COVID-19 pandemic and its consequences.

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Authors' Contributions

BND, TVT, and TVD analyzed the data and drafted the manuscript. BND, TVT, DTP, HCN, TTPN, HCN, THH, HKD, MVT, TVD, HQN, TTN, NPTN, CQT, KVT, TTD, HXP, LVN, KTN, PWC, and TVD contributed to conceptualization, investigation, methodology, validation, revising the manuscript. BND, TVT, DTP, HCN, TTPN, HCN, THH, HKD, MVT, TVD, HQN, TTN, NPTN, CQT, KVT, TTD, HXP, LVN, KTN, and TVD conducted data curation. All authors gave the final approval for the manuscript.

Conflicts of interest

None declared.

Abbreviations

AIPC: adherence to infection prevention and control

B: unstandardized regression coefficient

CI: confidence interval

COVID-19: coronavirus disease 2019

eHEAL: eHealth literacy

HCWs: health care workers

HL: health literacy

HLS-SF12: the 12 items short-form health literacy questionnaire

KMO: Kaiser-Meyer Olkin Measure

OR: odds ratio

PCA: principal component analysis

PPE: personal protective equipment

SARS: severe acute respiratory syndrome

SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

S-COVID-19-S: suspected COVID-19 symptoms

WHO: world health organization

Multimedia Appendix 1

Supplementary appendix

References

1. Greenberg N, Docherty M, Gnanapragasam S, Wessely S. Managing mental health challenges faced by healthcare workers during covid-19 pandemic. BMJ 2020 Mar 26;368:m1211. [doi: 10.1136/bmj.m1211] [Medline: 32217624]
2. Bassetti M, Vena A, Giacobbe DR. The novel Chinese coronavirus (2019-nCoV) infections: Challenges for fighting the storm. Eur J Clin Invest 2020 Mar:e13209. [doi: 10.1111/eci.13209] [Medline: 32003000]
3. Phelan AL, Katz R, Gostin LO. The Novel Coronavirus Originating in Wuhan, China: Challenges for Global Health Governance. JAMA 2020 Jan 30;323(8):709-710. [doi: 10.1001/jama.2020.1097] [Medline: 31999307]
4. Rubin R. The Challenge of Preventing COVID-19 Spread in Correctional Facilities. JAMA 2020 Apr 7;323(18):1760-1761. [doi: 10.1001/jama.2020.5427] [Medline: 32259189]
5. Xiang YT, Jin Y, Cheung T. Joint International Collaboration to Combat Mental Health Challenges During the Coronavirus Disease 2019 Pandemic. JAMA Psychiatry 2020 Apr 10:[In Press]. [doi: 10.1001/jamapsychiatry.2020.1057] [Medline: 32275289]
6. Campion J, Javed A, Sartorius N, Marmot M. Addressing the public mental health challenge of COVID-19. Lancet Psychiatry 2020 Jun 9:[In Press]. [doi: 10.1016/S2215-0366(20)30240-6] [Medline: 32531299]
7. Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, et al. The socio-economic implications of the coronavirus pandemic (COVID-19): A review. Int J Surg 2020 Jun;78:185-193. [doi: 10.1016/j.ijsu.2020.04.018] [Medline: 32305533]
8. Clark A, Jit M, Warren-Gash C, Guthrie B, Wang HHX, Mercer SW, et al. Global, regional, and national estimates of the population at increased risk of severe COVID-19 due to underlying health conditions in 2020: a modelling study. Lancet Glob Health 2020 Jun 15:[In Press]. [doi: 10.1016/S2214-109X(20)30264-3] [Medline: 32553130]
9. Banerjee A, Pasea L, Harris S, Gonzalez-Izquierdo A, Torralbo A, Shallcross L, et al. Estimating excess 1-year mortality associated with the COVID-19 pandemic according to underlying conditions and age: a population-based cohort study. Lancet 2020 May 30;395(10238):1715-1725. [doi: 10.1016/s0140-6736(20)30854-0] [Medline: 32405103]
10. Moradian N, Ochs HD, Sedikies C, Hamblin MR, Camargo CA, Jr., Martinez JA, et al. The urgent need for integrated science to fight COVID-19 pandemic and beyond. J Transl Med 2020 May 19;18(1):205. [doi: 10.1186/s12967-020-02364-2] [Medline: 32430070]
11. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. Lancet Psychiatry 2020 Apr 15;7(6):547-560. [doi: 10.1016/s2215-0366(20)30168-1] [Medline: 32304649]
12. Nazir M, Hussain I, Tian J, Akram S, Mangenda Tshiaba S, Mushtaq S, et al. A Multidimensional Model of Public Health Approaches Against COVID-19. Int J Environ Res Public Health 2020 May 26;17(11):3780. [doi: 10.3390/ijerph17113780] [Medline: 32466581]
13. Betsch C. How behavioural science data helps mitigate the COVID-19 crisis. Nat Hum Behav 2020 Mar 22;4(5):438. [doi: 10.1038/s41562-020-0866-1] [Medline: 32221514]
14. Bavel JJV, Baicker K, Boggio PS, Capraro V, Cichocka A, Cikara M, et al. Using social and behavioural science to support COVID-19 pandemic response. Nat Hum Behav 2020 May 2;4(5):460-471. [doi: 10.1038/s41562-020-0884-z] [Medline: 32355299]
15. Paakkari L, Okan O. COVID-19: health literacy is an underestimated problem. Lancet Public Health 2020 Apr 14;5(5):e249-e250. [doi: 10.1016/s2468-2667(20)30086-4] [Medline: 32302535]
16. Chong YY, Cheng HY, Chan HYL, Chien WT, Wong SYS. COVID-19 pandemic, infodemic and the role of eHealth literacy. Int J Nurs Stud 2020 Aug 1;108:103644. [doi:

10.1016/j.ijnurstu.2020.103644] [Medline: 32447127]
17. Vietnam Prime Minister. PM orders strict nationwide social distancing rules, starting April 1. 2020. URL: https://vietnamlawmagazine.vn/pm-orders-strict-nationwide-social-distancing-rules-starting-april-1-27108.html [accessed 2020-03-31].
18. Hao F, Tan W, Jiang L, Zhang L, Zhao X, Zou Y, et al. Do psychiatric patients experience more psychiatric symptoms during COVID-19 pandemic and lockdown? A case-control study with service and research implications for immunopsychiatry. Brain Behav Immun 2020 Apr 27;87:100-106. [doi: 10.1016/j.bbi.2020.04.069] [Medline: 32353518]
19. Ozamiz-Etxebarria N, Idoiaga Mondragon N, Dosil Santamaría M, Picaza Gorrotxategi M. Psychological Symptoms During the Two Stages of Lockdown in Response to the COVID-19 Outbreak: An Investigation in a Sample of Citizens in Northern Spain. Front Psychol 2020 Jun 18;11(1491):doi: 10.3389/fpsyg.2020.01491. [doi: 10.3389/fpsyg.2020.01491] [Medline: 32625157]
20. Di Renzo L, Gualtieri P, Pivari F, Soldati L, Attinà A, Cinelli G, et al. Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey. J Transl Med 2020 Jun 8;18(1):229. [doi: 10.1186/s12967-020-02399-5] [Medline: 32513197]
21. Ammar A, Brach M, Trabelsi K, Chtourou H, Boukhris O, Masmoudi L, et al. Effects of COVID-19 Home Confinement on Eating Behaviour and Physical Activity: Results of the ECLB-COVID19 International Online Survey. Nutrients 2020 May 28;12(6):1583. [doi: 10.3390/nu12061583] [Medline: 32481594]
22. Sidor A, Rzymski P. Dietary Choices and Habits during COVID-19 Lockdown: Experience from Poland. Nutrients 2020 Jun 3;12(6):1657. [doi: 10.3390/nu12061657] [Medline: 32503173]
23. Rodríguez-Pérez C, Molina-Montes E, Verardo V, Artacho R, García-Villanova B, Guerra-Hernández EJ, et al. Changes in Dietary Behaviours during the COVID-19 Outbreak Confinement in the Spanish COVIDiet Study. Nutrients 2020 Jun 10;12(6):1730. [doi: 10.3390/nu12061730] [Medline: 32531892]
24. Gong K, Xu Z, Cai Z, Chen Y, Wang Z. Internet Hospitals Help Prevent and Control the Epidemic of COVID-19 in China: Multicenter User Profiling Study. J Med Internet Res 2020 Apr 14;22(4):e18908. [doi: 10.2196/18908] [Medline: 32250962]
25. Sesagiri Raamkumar A, Tan SG, Wee HL. Measuring the Outreach Efforts of Public Health Authorities and the Public Response on Facebook During the COVID-19 Pandemic in Early 2020: Cross-Country Comparison. J Med Internet Res 2020 May 19;22(5):e19334. [doi: 10.2196/19334] [Medline: 32401219]
26. Shen C, Chen A, Luo C, Zhang J, Feng B, Liao W. Using Reports of Symptoms and Diagnoses on Social Media to Predict COVID-19 Case Counts in Mainland China: Observational Infoveillance Study. J Med Internet Res 2020 May 28;22(5):e19421. [doi: 10.2196/19421] [Medline: 32452804]
27. Abd-Alrazaq A, Alhuwail D, Househ M, Hamdi M, Shah Z. Top Concerns of Tweeters During the COVID-19 Pandemic: Infoveillance Study. J Med Internet Res 2020 Apr 21;22(4):e19016. [doi: 10.2196/19016] [Medline: 32287039]
28. Liu Q, Zheng Z, Zheng J, Chen Q, Liu G, Chen S, et al. Health Communication Through News Media During the Early Stage of the COVID-19 Outbreak in China: Digital Topic Modeling Approach. J Med Internet Res 2020 Apr 28;22(4):e19118. [doi: 10.2196/19118] [Medline: 32302966]
29. Liao Q, Yuan J, Dong M, Yang L, Fielding R, Lam WWT. Public Engagement and Government Responsiveness in the Communications About COVID-19 During the Early Epidemic Stage in China: Infodemiology Study on Social Media Data. J Med Internet Res 2020 May 26;22(5):e18796. [doi: 10.2196/18796] [Medline:
30. Ahmad AR, Murad HR. The Impact of Social Media on Panic During the COVID-19 Pandemic in Iraqi Kurdistan: Online Questionnaire Study. J Med Internet Res 2020 May 19;22(5):e19556.

[doi: 10.2196/19556] [Medline: 32369026]
31. Bao Y, Sun Y, Meng S, Shi J, Lu L. 2019-nCoV epidemic: address mental health care to empower society. Lancet 2020 Feb 22;395(10224):e37-e38. [doi: 10.1016/S0140-6736(20)30309-3] [Medline: 32043982]
32. Shimizu K. 2019-nCoV, fake news, and racism. Lancet 2020 Feb 11;395(10225):685-686. [doi: 10.1016/S0140-6736(20)30357-3] [Medline: 32059801]
33. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. Lancet 2020 Mar 14;395(10227):912-920. [doi: 10.1016/S0140-6736(20)30460-8] [Medline: 32112714]
34. Diviani N, van den Putte B, Giani S, van Weert JC. Low Health Literacy and Evaluation of Online Health Information: A Systematic Review of the Literature. J Med Internet Res 2015 May 5;17(5):e112. [doi: 10.2196/jmir.4018] [Medline: 25953147]
35. Norman CD, Skinner HA. eHealth Literacy: Essential Skills for Consumer Health in a Networked World. J Med Internet Res 2006 Jun 16;8(2):e9. [doi: 10.2196/jmir.8.2.e9] [Medline: 16867972]
36. Park HW, Park S, Chong M. Conversations and Medical News Frames on Twitter: Infodemiological Study on COVID-19 in South Korea. J Med Internet Res 2020 May 5;22(5):e18897. [doi: 10.2196/18897] [Medline: 32325426]
37. Ko NY, Lu WH, Chen YL, Li DJ, Wang PW, Hsu ST, et al. COVID-19-related information sources and psychological well-being: An online survey study in Taiwan. Brain Behav Immun 2020 Jul;87:153-154. [doi: 10.1016/j.bbi.2020.05.019] [Medline: 32389702]
38. Mackert M, Ball J, Lopez N. Health literacy awareness training for healthcare workers: Improving knowledge and intentions to use clear communication techniques. Patient Educ Couns 2011 Dec;85(3):e225-e228. [doi: 10.1016/j.pec.2011.02.022] [Medline: 21474264]
39. Yunyongying P, Rich M, Jokela J. Patient-Centered Performance Metrics. JAMA 2019 May 14;321(18):1829-1829. [doi: 10.1001/jama.2019.2056] [Medline: 31087017]
40. McKinn S, Linh DT, Foster K, McCaffery K. Communication Between Health Workers and Ethnic Minorities in Vietnam. Health Lit Res Pract 2017 Oct;1(4):e163-e172. [doi: 10.3928/24748307-20170629-01] [Medline: 31294262]
41. Tavakoly Sany SB, Behzhad F, Ferns G, Peyman N. Communication skills training for physicians improves health literacy and medical outcomes among patients with hypertension: a randomized controlled trial. BMC Health Serv Res 2020 Jan 23;20(1):60-60. [doi: 10.1186/s12913-020-4901-8] [Medline: 31973765]
42. Wang M-J, Hung L-C, Lo Y-T. Glycemic control in type 2 diabetes: role of health literacy and shared decision-making. Patient Prefer Adherence 2019 May 24;13:871-879. [doi: 10.2147/PPA.S202110] [Medline: 31213781]
43. Redelmeier DA, Shafir E. Pitfalls of judgment during the COVID-19 pandemic. Lancet Public Health 2020 Apr 23;5(6):e306-e308. [doi: 10.1016/S2468-2667(20)30096-7] [Medline: 32334647]
44. Sentell T, Vamos S, Okan O. Interdisciplinary Perspectives on Health Literacy Research Around the World: More Important Than Ever in a Time of COVID-19. Int J Environ Res Public Health 2020 Apr 26;17(9):3010. [doi: 10.3390/ijerph17093010] [Medline: 32357457]
45. Prime Minister of Vietnam. Gov't extends social distancing for at least one week in 28 localities. 2020. URL: http://news.chinhphu.vn/Home/Govt-extends-social-distancing-for-at-least-one-week-in-28-localities/20204/39735.vgp [accessed 2020-04-15].
46. Prime Minister of Vietnam. Gov't to gradually ease COVID-19 control measure in cautious manner. 2020. URL: http://primeminister.chinhphu.vn/Home/Govt-to-gradually-ease-COVID19-control-measure-in-cautious-manner/20204/3759.vgp [accessed 2020-04-20].
47. Quan H, Li B, Couris CM, Fushimi K, Graham P, Hider P, et al. Updating and Validating the Charlson Comorbidity Index and Score for Risk Adjustment in Hospital Discharge Abstracts

Using Data From 6 Countries. Am J Epidemiol 2011 Mar 15;173(6):676-682. [doi: 10.1093/aje/kwq433] [Medline: 21330339]
48. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis 1987 1987;40(5):373-383. [doi: 10.1016/0021-9681(87)90171-8] [Medline: 3558716]
49. Duong TV, Aringazina A, Baisunova G, Nurjanah N, Pham TV, Pham KM, et al. Development and validation of a new short-form health literacy instrument (HLS-SF12) for the general public in six Asian countries. Health Lit Res Pract 2019 Apr 10;3(2):e91-e102. [doi: 10.3928/24748307-20190225-01] [Medline: 31294310]
50. Duong TV, Nguyen TTP, Pham KM, Nguyen KT, Giap MH, Tran TDX, et al. Validation of the Short-Form Health Literacy Questionnaire (HLS-SF12) and Its Determinants among People Living in Rural Areas in Vietnam. Int J Environ Res Public Health 2019 Sep 11;16(18):3346. [doi: 10.3390/ijerph16183346] [Medline: 31514271]
51. Ho HV, Hoang GT, Pham VT, Duong TV, Pham KM. Factors associated with health literacy among the elderly people in Vietnam. Biomed Res Int 2020 Mar 27;2020:1-7. [doi: 10.1155/2020/3490635] [Medline: 32309429]
52. Nguyen HC, Nguyen MH, Do BN, Tran CQ, Nguyen TTP, Pham KM, et al. People with Suspected COVID-19 Symptoms Were More Likely Depressed and Had Lower Health-Related Quality of Life: The Potential Benefit of Health Literacy. J Clin Med 2020 Mar 31;9(4):965. [doi: 10.3390/jcm9040965] [Medline: 32244415]
53. Nguyen HT, Do BN, Pham KM, Kim GB, Dam HTB, Nguyen TT, et al. Fear of COVID-19 Scale—Associations of Its Scores with Health Literacy and Health-Related Behaviors among Medical Students. Int J Environ Res Public Health 2020 Jun 11;17(11):4164. [doi: 10.3390/ijerph17114164] [Medline: 32545240]
54. HLS-EU Consortium. Comparative report of health literacy in eight EU member states. The European Health Literacy Project 2009–2012. 2012. URL: https://www.healthliteracyeurope.net/hls-eu [accessed 2012-10-22].
55. Norman CD, Skinner HA. eHEALS: The eHealth Literacy Scale. J Med Internet Res 2006 Nov 14;8(4):e27. [doi: 10.2196/jmir.8.4.e27] [Medline: 17213046]
56. World Health Organisation. Risk assessment and management of exposure of health care workers in the context of COVID-19: Interim guidance. 2020. URL: https://www.who.int/publications/i/item/risk-assessment-and-management-of-exposure-of-health-care-workers-in-the-context-of-covid-19-interim-guidance [accessed 2020-03-19].
57. Editorial Team. Overview of novel coronavirus (2019-nCoV). 2020. URL: https://bestpractice.bmj.com/topics/en-gb/3000165 [accessed 2020-02-10].
58. Kaiser HF. An index of factorial simplicity. Psychometrika 1974 Mar;39(1):31-36. [doi: 10.1007/BF02291575] [Medline:
59. Kimberlin CL, Winterstein AG. Validity and reliability of measurement instruments used in research. Am J Health Syst Pharm 2008 Dec 1;65(23):2276-2284. [doi: 10.2146/ajhp070364] [Medline: 19020196]
60. Terwee CB, Bot SDM, de Boer MR, van der Windt DAWM, Knol DL, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol 2007 Jan;60(1):34-42. [doi: 10.1016/j.jclinepi.2006.03.012] [Medline: 17161752]
61. Cronbach LJ, Shavelson RJ. My current thoughts on coefficient alpha and successor procedures. Educ Psychol Meas 2004 Jun 1;64(3):391-418. [doi: 10.1177/0013164404266386] [Medline:
62. Maldonado G, Greenland S. Simulation Study of Confounder-Selection Strategies. Am J Epidemiol 1993 Dec 1;138(11):923-936. [doi: 10.1093/oxfordjournals.aje.a116813] [Medline: 8256780]
63. Field A. *Discovering statistics using IBM SPSS statistics*. 4th ed. Sage; 2013.
64. Sørensen K, Pelikan JM, Röthlin F, Ganahl K, Slonska Z, Doyle G, et al. Health literacy in

Europe: comparative results of the European health literacy survey (HLS-EU). Eur J Public Health 2015 Apr 5;25(6):1053-1058. [doi: 10.1093/eurpub/ckv043] [Medline: 25843827]
65. Duong TV, Chiu C-H, Lin C-Y, Wong T-C, Chen Y-C, Chang PW, et al. E-healthy diet literacy scale and its relationship with behaviors and health outcomes in Taiwan. Health Promot Int 2020 [doi: 10.1093/heapro/daaa033] [Medline: 32267935]
66. Zrubka Z, Hajdu O, Rencz F, Baji P, Gulácsi L, Péntek M. Psychometric properties of the Hungarian version of the eHealth Literacy Scale. Eur J Health Econ 2019 Jun;20(Suppl 1):57-69. [doi: 10.1007/s10198-019-01062-1] [Medline: 31098883]
67. Shiferaw KB, Mehari EA. Internet use and eHealth literacy among health-care professionals in a resource limited setting: a cross-sectional survey. Adv Med Educ Pract 2019 Aug 24;10:563-570. [doi: 10.2147/AMEP.S205414] [Medline: 31440113]
68. Duong TV, Sørensen K, Pelikan J, Van den Broucke S, Lin IF, Lin Y-C, et al. Health-related behaviors moderate the association between age and self-reported health literacy among Taiwanese women. Women Health 2017 Jul 6;58(6):632-646. [doi: 10.1080/03630242.2017.1333074] [Medline: 28537772]
69. Kayupova G, Turdaliyeva B, Tulerayev K, Duong TV, Chang PW, Zagulova D. Health literacy among visitors of district polyclinics in Almaty, Kazakhstan. Iran J Public Health 2017 Aug;46(8):1062-1070. [doi: [Medline: 28894707]
70. Duong TV, Aringazina A, Baisunova G, Nurjanah, Pham TV, Pham KM, et al. Measuring health literacy in Asia: Validation of the HLS-EU-Q47 survey tool in six Asian countries. J Epidemiol 2017 Feb 1;27(2):80-86. [doi: 10.1016/j.je.2016.09.005] [Medline: 28142016]
71. Palesy D, Jakimowicz S. Health literacy training for Australian home care workers: Enablers and barriers. Home Health Care Serv Q 2019 Apr 20;38(2):80-95. [doi: 10.1080/01621424.2019.1604458] [Medline: 31007141]
72. Elisabeth Stømer U, Klopstad Wahl A, Gunnar Gøransson L, Hjorthaug Urstad K. Health literacy in kidney disease: Associations with quality of life and adherence. J Ren Care 2020 Jan 16;46(2):85-94. [doi: 10.1111/jorc.12314] [Medline: 31950601]
73. Huang Y-M, Shiyanbola OO, Chan H-Y. A path model linking health literacy, medication self-efficacy, medication adherence, and glycemic control. Patient Educ Couns 2018 Nov; [doi: 10.1016/j.pec.2018.06.010] [Medline: 29935739]
74. Lor M, Koleck TA, Bakken S, Yoon S, Dunn Navarra A-M. Association Between Health Literacy and Medication Adherence Among Hispanics with Hypertension. J Racial Ethn Health Disparities 2019 Jan 3; [doi: 10.1007/s40615-018-00550-z] [Medline: 30607576]
75. Skoumalova I, Kolarcik P, Madarasova Geckova A, Rosenberger J, Majernikova M, Klein D, et al. Is Health Literacy of Dialyzed Patients Related to Their Adherence to Dietary and Fluid Intake Recommendations? Int J Environ Res Public Health 2019 Nov 5;16(21):4295. [doi: 10.3390/ijerph16214295] [Medline: 31694265]
76. Li S, Feng B, Liao W, Pan W. Internet Use, Risk Awareness, and Demographic Characteristics Associated With Engagement in Preventive Behaviors and Testing: Cross-Sectional Survey on COVID-19 in the United States. J Med Internet Res 2020 Jun 16;22(6):e19782. [doi: 10.2196/19782] [Medline: 32501801]
77. Alsan M, Stantcheva S, Yang D, Cutler D. Disparities in Coronavirus 2019 Reported Incidence, Knowledge, and Behavior Among US Adults. JAMA Netw Open 2020 Jun 1;3(6):e2012403. [doi: 10.1001/jamanetworkopen.2020.12403] [Medline: 32556260]
78. Duong TV, Lin I-F, Sørensen K, Pelikan JM, Van den Broucke S, Lin Y-C, et al. Health literacy in Taiwan: a population-based study. Asia Pac J Public Health 2015 Nov;27(8):871-880. [doi: 10.1177/1010539515607962] [Medline: 26419635]
79. Watson R. Europeans with poor "health literacy" are heavy users of health services. BMJ 2011 Nov 29;343:d7741. [doi: 10.1136/bmj.d7741] [Medline: 22127773]
80. Greenhalgh T. Health literacy: towards system level solutions. BMJ 2015 Feb 24;350:h1026.

[doi: 10.1136/bmj.h1026] [Medline: 25712067]
81. Britt RK, Collins WB, Wilson K, Linnemeier G, Englebert AM. eHealth Literacy and Health Behaviors Affecting Modern College Students: A Pilot Study of Issues Identified by the American College Health Association. J Med Internet Res 2017 Dec 19;19(12):e392. [doi: 10.2196/jmir.3100] [Medline: 29258979]
82. Mitsutake S, Shibata A, Ishii K, Oka K. Associations of eHealth Literacy With Health Behavior Among Adult Internet Users. J Med Internet Res 2016 Jul 18;18(7):e192. [doi: 10.2196/jmir.5413] [Medline: 27432783]
83. Owen L, Corfe B. The role of diet and nutrition on mental health and wellbeing. Proc Nutr Soc 2017 Nov;76(4):425-426. [doi: 10.1017/s0029665117001057] [Medline: 28707609]
84. Ministry of Health. Coronavirus disease (COVID-19) outbreak in Vietnam. 2020. URL: https://ncov.moh.gov.vn/ [accessed 2020-05-04].

Supplementary Files

Multimedia Appendixes

Supplementary Appendix.
URL: https://asset.jmir.pub/assets/d40032ceceabe4c3ff3be76e4376e9d2.docx

Main Tables (Table 1, Table 2, Table 3, Table 4).
URL: https://asset.jmir.pub/assets/29bc5b70b2f50a136ceebc732676900e.docx