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# Comparison of Non-AI and AI-Enabled M-Health Platforms for COVID-19 Self Screening in Indonesia

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> Abstract. This study aimed to analyze and differentiate the role of AI and no AIsupported m-health platforms for COVID-19 self-screening in Indonesia. We utilized a mysterious shopping method to develop four standardized cases with various severity levels of COVID-19 tested in Indonesia's most popular mHealth platforms. We selected seven apps from the top 200 free mHealth apps in the "Medical" category in the Google Play Store equipped with COVID-19 symptom checkers. A total of 36 teleconsultations were performed in four chatbot-based, two apps supported with AI combined with a human-based approach, and three apps with the human-based process. Teleconsultations were recorded, classified, and analyzed compared with the COVID-19 guideline by the MoH of Indonesia. The study indicated that most of the self-screening provided questions that had consistently led to the COVID-19 condition such as cough, fever, and shortness of breath and followed the guideline from the national health authority.

Keywords: COVID-19, mHealth apps, self-screening, artificial intelligence

### 1. Introduction

Chatbots, or artificial intelligence (AI)-based conversational agents, are computer programs that can converse with humans [1,2]. An industry that had been changing at a plodding pace before 2020 has been forced to rapidly embrace advances like telemedicine and health chatbots on a far grander scale to navigate the pandemic crisis. Due to the COVID-19 pandemic, artificial intelligence (AI) chatbot has increasingly been used in telemedicine services [2]. AI chatbot-based symptom tracking programs have risen to the forefront of the COVID-19-related apps as a self-screening tool to collect patient health information from a list of questions concerned with COVID-19 symptoms [3].

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At the early stage of the pandemic, the Indonesian Ministry of Health permitted the use of digital health applications to support the combat COVID-19 [4]. The number of mHealth apps for COVID-19 is rapidly growing; however, the quality of the apps related to COVID-19 in Indonesia is still unknown, and the regulation of the mHealth app is still lacking [5]. Previous research has reviewed the current literature on COVID-19 related chatbots and evaluated existing self-reported symptom tracking programs in the United States for COVID-19 [6]. This study aimed to analyze and differentiate the role of AI and non AI-supported chatbots consultation for COVID-19 self-screening in Indonesia using framework analysis.

# 2. Methods

Two researchers selected the apps in October 2021. Android-based mHealth apps that were available on the Google Play Store were chosen based on the particular inclusion and exclusion criteria: (1) Free download apps in the "Medical" category; (2) Using the Indonesian language; (3) Has a rating of >4/5; (4) Downloaded by >100,000 people; (5) Having associations with reputable health organization; (6) 4) Last updated before July 2021; (7) Providing the consulting services and or symptoms checking for COVID-19 available in AI chabot, Non-AI, or mixed approached. An AI chatbot is characterized as a computer program that can converse with humans for COVID-19 symptom checks, a non-AI approach employs a human approach in consultation management, and a mixed approach combines an AI chatbot and a non-AI approach. Two researchers applied the mysterious shopping approach by playing the role of simulated patients using teleconsultation services with four well-structured scenarios to approximate typical COVID-19 presentations (mild and severe-critical) and survey the range of costs. The usefulness of each app was not examined in this study because the number of respondents was limited and their background is not varied. The teleconsultations were held from November to December 2021. The cases were created and classified based on the Handbook of Covid-19 Management Protocol released by The Ministry of Health of the Republic of Indonesian. We received ethical clearance from the Ethics Committee at the Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada with the reference number KE/FK/1213/EC/2021 and Prof. Dr. dr. Sri Sutami, Sp.S(K). as the panel's chairperson.

#### 3. Results

We selected seven apps that met the requirements, namely Alodokter, Good Doctor, Halodoc, Klik Dokter, MySiloam, PIKOBAR Jawa Barat, and SehatQ. The researcher collected clinical information on the risk of COVID-19 through several symptom checkers based on the AI approach and doctor consultation (human process) in certain apps within two weeks.

About 36 teleconsultations were performed in the AI-enabled, hybrid, and humanbased mHealth platform for approximately 15-30 minutes. The costs that need to be incurred by patients to access teleconsultation vary. Some apps provided free consultation promos so that patients did not have to pay money for doctor consultations. Paid services with the doctors range from IDR 5,000.00 to IDR 40,000.00 (about 0.35 to 2.80 USD). Whereas checking the symptoms through all chatbots was free.

	Clinical Information (signs/symptoms)	Simulated Consultation				
No.		n=36				
		AI	Mixed	Non-AI	Average (%)	
		n=16	n=8	n=12	n=36	
1	Cough?	100%	100%	66.70%	88.90%	
2	Fever >38°C or subjective fever?	100%	75%	41.70%	75%	
3	Shortness or difficulty of breath?	100%	100%	16.70%	72.20%	
4	Sore throat?	75%	100%	8.30%	58.30%	
5	Cold (runny nose/sneezing/congestion)?	75%	50%	41.70%	58.30%	
6	Dry cough or productive cough?	50%	50%	58.30%	52.80%	
7	When did the symptoms start?	25%	75%	58.30%	47.20%	
8	Altered mental status or consciousness or trouble breathing or talking?	75%	37.50 %	0%	41.70%	
9	Anosmia and/or ageusia?	50%	50%	25%	41.70%	
10	Headache?	43.80%	12.50 %	8.30%	25%	
11	Fatigue?	50%	0%	0%	22.20%	
12	Myalgia?	50%	0%	0%	22.20%	
13	What is the body temperature?	25%	50%	0%	22.20%	
14	Difficulty completing normal activities such as eating, taking a shower, working?	12.50%	75%	0%	22.20%	
15	Persistent pain or pressure in the chest?	25%	0%	0%	11.10%	
16	Nausea?	25%	0%	0%	11.10%	
17	Vomit?	25%	0%	0%	11.10%	
18	Diarrhea?	25%	0%	0%	11.10%	
19	What is oxygen saturation?	0%	12.50 %	25%	11.10%	
20	Depending on skin tone, any pale, grey, blue-colored skin, lips, or nail beds?	12.50%	0%	0%	5.60%	
21	What is the respiratory rate?	0%	25%	0%	5.60%	
22	Abdominal pain?	0%	0%	0%	0%	
23	Conjunctivitis?	0%	0%	0%	0%	
24	Skin rash?	0%	0%	0%	0%	

Table 1.	. Data	Elements	of	Clinical	Information
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AI= Artificial Intelligence-enabled platform

Based on our findings, the most frequently asked in AI chatbot was whether the patient had a cough, shortness of breath, fever, sore throat, cold, and altered mental status. In order, cough, shortness of breath, sore throat, the onset of symptoms, and fever were the most common questions in AI combined with a human-based approach. The doctors often asked whether the patient had a cough, dry cough, or productive cough, the onset of the symptoms, fever, and cold. Overall, questions about whether the patient had coughs (88.9%), fever (75%), shortness of breath (72.2%), sore throat (58.3%), and cold (58.3%) were the most frequent questions during the consultation.

# 4. Discussion

This finding shows that most chatbot-based symptom checkers provided more questions than the non-AI-platforms [7,8]. Therefore, it showed that the list of questions in the AI-supported symptom checkers was constructed and programmed according to the national guideline for COVID-19 screening [9]. Fortunately, AI-enabled platforms were faster compared to the human-based app. It will, in turn, allow patients to obtain treatment more quickly than the conventional one [10]. Besides, checking the risk with AI was less expensive than having teleconsultation with physicians, as AI chatbots were free, which

228

made it more accessible. However, we only evaluated the apps by our simulated scenario. The number of standardized simulation cases was too small to yield a broader query algorithm since there were many variations of COVID-19 symptoms. We did not analyze the usefulness and the accuracy of diagnosis in all apps. The usage of AI will become more plentiful, but quality will be determined by the user's response.

# 5. Conclusions

COVID-19 symptom checkers were valuable tools for pre-assessment and screening amid pandemic emergencies. Our finding shows that AI-enabled platforms provided more questions than the non-AI-enabled m-health platforms for COVID-19 selfscreening. It is recommended that the government and health app producers work together to build standardized, high-quality health apps with a variety of features, not only limited to chatbots. Further studies are needed to evaluate the quality of services, the effectiveness, the usefulness, ethics, biases, and accuracy of symptom checkers for COVID-19 accessible in Indonesia.

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