



The Relationship Between Thermal Comfort Perception and Compliance with Mask Usage During the COVID-19 Pandemic in Caturtunggal Village, Depok Subdistrict, Sleman Regency

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ABSTRACT

The purpose of this study was to examine the relationship between thermal comfort perception and compliance with mask usage during the COVID-19 pandemic. This research employed an inferential method with a cross-sectional approach. The sampling technique used was non-probability sampling, specifically accidental sampling. The study population consisted of 35,554 respondents, focusing on the productive age group of 18–56 years, with a final sample of 396 respondents. Data were collected using demographic instruments and measures of mask-wearing compliance. Data analysis was conducted using univariate, bivariate, and Kendall's Tau correlation tests. The results, analyzed with SPSS, indicated that the hypothesis was accepted, as the significance value (2-tailed) was $0.14 > 0.05$, showing a meaningful correlation between the variables. However, the study concluded that there was no significant relationship between thermal comfort perception and compliance with mask usage during the COVID-19 pandemic in Caturtunggal Village, Depok Subdistrict, Sleman Regency.

Keywords:

Thermal comfort
Compliance
Mask usage

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INTRODUCTION

The emergence of COVID-19 cases resembling pneumonia occurred in Wuhan, China, on December 31, 2019 (Devi Herliandry, Suban, & Kuswanto, 2020). This event was caused by the coronavirus, known as COVID-19 (Corona Virus Disease 2019). Coronavirus is an RNA virus with particle sizes ranging from 60–140 nm (Hadinata, 2019). The causative agent of COVID-19 belongs to the genus Betacoronavirus, the same genus responsible for Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS) (Hadinata, 2019). The virus can penetrate mucous membranes, particularly nasal and laryngeal mucosa, subsequently entering the lungs through the respiratory tract and then reaching target organs (Hadinata, 2019). Common signs and symptoms of COVID-19 infection primarily affect the respiratory system, such as fever, cough, and shortness of breath, with an average incubation period of 5–6 days and a maximum of 14 days (Rilatupa, 2008).



According to Kuswoyo (2021), COVID-19 has become a global pandemic, with 17,660,523 confirmed positive cases in 216 countries worldwide and 680,894 deaths as of June 2021. The United States had the highest number of positive cases at 34,445,61 with 28,843,610 recoveries, followed by India with 30,082,69 cases and 29,056,609 recoveries, and Brazil with 18,169,881 cases and 16,483,635 recoveries (Kuswoyo, 2021). Based on data from the COVID-19 Handling Task Force, as of June 30, 2021, Indonesia recorded 2,178,272 positive cases, 239,368 active cases, 1,880,413 recoveries, and 58,491 deaths (Pardiyanto, 2021). Indonesia experienced the first wave of COVID-19 following the Christmas and New Year holidays in January 2021, followed by a second wave starting in June 2021 (Pardiyanto, 2021).

In the Special Region of Yogyakarta, 16,092 cases were reported, with 68.15% hospitalized, 1.87% deaths, and 29.98% recoveries, totaling 26,288 cases (Kuswoyo, 2021). Despite recoveries, the number of COVID-19 cases continues to rise, particularly in Yogyakarta Province, with 980 hospitalized, 92 deaths, and 1,879 recoveries (Kuswoyo, 2021). In Sleman Regency, 1,710 cases were hospitalized, 20 deaths, and 4,291 recoveries; Bantul Regency recorded 1,520 hospitalized, 100 deaths, and 2,976 recoveries; Gunung Kidul Regency had 412 hospitalized, 34 deaths, and 691 recoveries; and Kulon Progo Regency had 556 hospitalized, 20 deaths, and 684 recoveries as of January 13, 2021 (Kuswoyo, 2021).

According to health protocol monitoring in Sleman Regency on February 14, 2022, the highest number of active cases was in Depok Subdistrict with 1,349 active cases. Depok consists of three villages: Caturtunggal, Condongcatur, and Maguoharjo. Compliance with social distancing and avoiding crowds in Caturtunggal was 59.38%, Condongcatur 80.9%, and Maguoharjo 97.88%, indicating that adherence to the 5M health protocol to prevent COVID-19 transmission was not yet optimal (Syarifah & Chasanah, 2021).

Comfort is the interaction and reaction of humans with the environment, free from negative feelings and inherently individual. Comfort includes psychological and physical aspects. Psychological comfort refers to subjective feelings of ease, calm, and happiness, while physical comfort can be measured objectively and includes thermal comfort. Thermal comfort ranges from hot to cold and is generally defined as the state of satisfaction in the surrounding environment (Sugini, 2004). Lippsmeier (1994) added that reflection, absorption, and solar radiation also influence thermal comfort. The level of thermal comfort perceived by humans is significantly affected by climate, surroundings, building design, and individual satisfaction with their environment (Aeni, 2021).

Thermal comfort is essential for optimal human activity, alongside visual and auditory comfort and indoor air quality in homes, schools, offices, or workplaces. According to Szokolay (1973), comfort depends on climatic variables (solar radiation, air temperature, humidity, wind speed) and individual factors such as clothing, acclimatization, age, sex, obesity, health, diet, and skin color. Discomfort arises when environmental conditions deviate from the norm and can range from annoyance to pain depending on the extent of imbalance (Szokolay, 1973).

Efforts to prevent COVID-19 from the COVID-19 Behavioral Change Task Force focus on promoting the 3M protocol: mask-wearing, social distancing, and handwashing (Bharata,

2019). As of September 14, 2020, 17% of respondents believed they would not contract COVID-19, which may lead to negligence of the 3M protocol (Bharata, 2019). Global policies, including in Indonesia, recommended universal mask usage to limit transmission from asymptomatic and pre-symptomatic carriers (Pinasti, 2020).

Worldwide studies indicate limited evidence that mask usage controls influenza and highlight potential issues such as poor compliance and improper use (Fitria, 2021). In China, 41.8% of respondents did not wash hands before using a mask, 58.8% reused disposable masks, and 37.6% did not replace masks after more than eight hours of use (Lesilolo, 2021). Pratiwi (2020) reported 35.5% of the population rarely used masks, and 6.7% did not use masks at all, despite masks protecting oneself and others from COVID-19 transmission (Lesilolo, 2021). Students, although at lower risk of infection, can be carriers due to asymptomatic transmission (Lesilolo, 2021). Policies such as staying at home and large-scale social restrictions (PSBB) were implemented to respond to health emergencies (Munawaroh & Murwadi, n.d.).

COVID-19 has caused a global health crisis affecting daily life (Rilatupa, 2008). Government prevention efforts include the 5M health protocol: mask-wearing, social distancing, handwashing, avoiding crowds, and reducing activities (Rilatupa, 2008). Additionally, balanced nutrition and multivitamins help maintain immunity (Rilatupa, 2008).

Mask usage is one of the most comprehensive methods to prevent coronavirus spread (Kuswoyo, 2021). Masks include medical masks, respirators, and cloth masks (Pardiyanto, 2021). Medical masks are single-use with a maximum duration of approximately four hours and cannot be reused if wet, offering 44% particle penetration protection (Pardiyanto, 2021). Respirators protect healthcare workers exposed to the virus (Pardiyanto, 2021). Cloth masks serve as self-protection, typically consisting of three layers: cotton inner layer, optimal filtering middle layer (cotton/polyester), and a hydrophobic outer layer (polypropylene) (Kuswoyo, 2021).

Controlling COVID-19, a respiratory disease, requires rigorous measures, including proper mask usage (Munawaroh & Murwadi, n.d.). In Indonesia, the "Everyone Wear a Mask" campaign mandates mask-wearing outdoors per Presidential Decree No. 11/2020 (Bharata, 2019). However, non-compliance persists due to social perception, lack of knowledge of transmission risk, and discomfort (Hadinata, 2019). Studies show discomfort, especially thermal and physical, as major barriers to mask usage (Hadinata, 2019).

Perception is the process of understanding or assigning meaning to information obtained via sensory input, linking and organizing sensory data to interpret the surrounding environment (Ridho, 2015). Thermal comfort is the satisfaction with environmental conditions, including air temperature, airflow, body metabolism, and humidity (Purnamasari & Raharyani, 2020). Clothing, air temperature, radiation, wind speed, and humidity influence thermal comfort; extreme conditions cause heat or cold discomfort (Purnamasari & Raharyani, 2020).

Compliance refers to obedience to rules and instructions, encompassing conformity, acceptance, and obedience to authority (Hidayanti Syam, 2020). Mask-wearing compliance

reflects positive behavior influenced by knowledge, motivation, perception, beliefs, environmental variables, instruction quality, and access to resources (Yuliana, 2020). Non-compliance arises when obstacles hinder adherence despite willingness (Morfi et al., 2020).

Wicaksono (2021) noted two perspectives on mask usage during physical activity: recommendations to wear or not wear masks, depending on activity intensity (light, moderate, or heavy). Preliminary study on March 8, 2022, in Papringan Hamlet, Caturtunggal Village, Depok, Sleman, Yogyakarta, showed that 3 of 5 respondents (65%) felt slightly cold (AD) and were more compliant with mask usage.

Based on the above background, high COVID-19 cases in Indonesia correlate with public non-compliance with mask usage, influenced by thermal comfort. Therefore, this study investigates the relationship between thermal comfort perception and mask-wearing compliance during the COVID-19 pandemic in Caturtunggal Village, Depok Subdistrict, Sleman Regency, which exhibits the highest non-compliance in the district. The findings can guide assessments of public comfort regarding mask usage during the pandemic and provide a basis for further research. While studies on thermal conditions and mask usage are limited, numerous studies address COVID-19, including virus characteristics, vaccines, and health protocols.

METHODS

This study employed an inferential research design. Inferential research falls under correlational research and aims to determine the relationship between two variables (Sugiono, 2019). A cross-sectional design was used, where data collection occurred at a specific point in time, and each respondent was surveyed only once for all variables under study (Sugiono, 2019). This research specifically analyzed the relationship between thermal comfort perception and mask-wearing compliance during the COVID-19 pandemic in Caturtunggal Village, Depok Subdistrict, Sleman Regency.

The study was conducted in Caturtunggal Village, Depok, Sleman. This location was selected because, during the pandemic, it was identified as a high-risk area for COVID-19 exposure, requiring strict adherence to health protocols, including mask usage. Data collection took place between August and September 2022.

The population consisted of all residents of Caturtunggal Village aged 18-56 years, totaling 35,554 individuals. According to Sugiono (2019), a population is a generalization area consisting of subjects with specific characteristics determined by the researcher to be studied, from which conclusions are drawn. Due to the large population, a sample was selected using non-probability sampling with an accidental sampling technique, where respondents were chosen based on availability while meeting the inclusion criteria. The sample size was calculated using Slovin's formula (Yamane, 1967), resulting in a minimum of 396 respondents. The sample was then distributed proportionally across the 20 hamlets of Caturtunggal Village based on the productive-age population (18-56 years) (Sugiyono, 2019).

Inclusion criteria required respondents to be willing participants aged 18–56 years, while exclusion criteria included unwilling respondents, those outside the specified age range, or incomplete questionnaire responses (Sugiono, 2019).

The independent variable in this study was thermal comfort perception, defined as the respondents' subjective evaluation of comfort or discomfort associated with temperature in indoor or outdoor environments (Sugiono, 2019). The dependent variable was mask-wearing compliance, defined as the behavior and attitudes of individuals in following mask usage recommendations during the COVID-19 pandemic (Sugiono, 2019). Both variables were measured using structured questionnaires. Thermal comfort perception was assessed using a modified Likert-scale questionnaire from Muhammad Alif Lutfi's study, with scores ranging from "Cold" (4), "Neutral" (3), "Slightly Hot" (2), to "Hot" (1). Respondents' body temperature was also recorded using a thermogun to provide an objective reference. Mask-wearing compliance was measured using a modified questionnaire from Dede Khairuddin (2015), with a Likert-scale ranging from "Always" (4), "Often" (3), "Sometimes" (2), to "Never" (1), reflecting favorable behavior.

Prior to the main study, instrument validity and reliability were tested. Validity was assessed using a pilot sample of 30 respondents aged 18–56 years, with items analyzed in SPSS; items with Sig. (2-tailed) greater than the r-table were considered valid (Sugiono, 2016). Reliability was tested using Cronbach's Alpha, with instruments considered reliable if the calculated r-value exceeded the r-table at the 5% significance level (Sugiono, 2016).

Primary data were collected through questionnaires capturing demographic information, thermal comfort perception, and mask-wearing compliance. Data processing involved editing, coding, data entry into Microsoft Excel and SPSS, tabulating, and cleaning to ensure accuracy (Sugiono, 2015). Coding assigned numeric values to each response: gender (1 = male, 2 = female), education (1 = elementary, 2 = junior high, 3 = senior high, 4 = university), thermal comfort perception (4 = Cold, 3 = Neutral, 2 = Slightly Hot, 1 = Hot), and mask-wearing compliance (4 = Always, 3 = Often, 2 = Sometimes, 1 = Never).

Data analysis included univariate and bivariate techniques. Univariate analysis described the characteristics of each variable using percentages (Sugiono, 2019). Bivariate analysis examined the relationship between thermal comfort perception and mask-wearing compliance using Kendall's Tau correlation, a non-parametric statistic suitable for ordinal data. This analysis assessed whether a relationship existed, its strength, and the direction (positive or negative) between the variables (Sugiono, 2019).

RESULTS AND DISCUSSION

Validity and Reliability Testing

The validity of the research instrument was tested using SPSS with a pilot sample of 30 respondents, yielding a validity rate of 96.8%. This was determined by comparing the Sig. (2-tailed) value with the r-table; for 30 respondents, the Sig. (2-tailed) value must exceed 0.361 to be considered valid (Sugiono, 2016).

Following validity testing, reliability was assessed to determine whether the questionnaire could be used in subsequent studies. The Cronbach's Alpha value obtained was 0.239, which is considered low, as it falls below the acceptable threshold of 0.6 (Sugiyono, 2016). Therefore, the questionnaire was deemed unreliable for repeated use.

Univariate Analysis

Univariate analysis aimed to describe the characteristics of the study sample by constructing frequency distribution tables for both independent and dependent variables. The sample consisted of 369 respondents from Caturtunggal Village, Depok, Sleman Regency, who willingly participated and completed the research questionnaire. Data were initially processed in Microsoft Excel and further analyzed using SPSS 25.0.

Among the respondents, 217 (54.8%) were female, and 179 (45.2%) were male. Age distribution indicated that the majority of respondents were in the 39–48 years category (167 respondents, 42.2%), followed by 29–38 years (108 respondents, 27.3%), 49–58 years (69 respondents, 17.4%), and 18–28 years (52 respondents, 13.1%). Regarding educational background, 30 respondents (7.6%) had completed elementary school, 42 (10.6%) junior high school, 228 (57.6%) senior high school, and 96 (24.2%) higher education. Occupationally, 168 respondents (42.4%) were private employees, 158 (39.9%) were traders, 61 (15.4%) were housewives or unemployed, and 9 (2.3%) were students, indicating that private employees and traders constituted the largest groups in Sleman Regency.

Thermal comfort perception results indicated that 269 respondents (93.2%) felt comfortable, while 27 respondents (6.8%) reported discomfort. This trend may be attributed to habituation during the pandemic, where mask-wearing indoors and outdoors became routine. Respondents, particularly private employees working in enclosed spaces, reported maintaining mask compliance despite hot conditions. Some respondents noted that even if masks felt slightly warm, they provided protection from pollutants and dust.

Mask-wearing compliance was uniformly high, with all 396 respondents (100%) categorized as compliant. While not all respondents achieved perfect scores on the questionnaire, overall data indicated adherence to health protocols, reflecting the high-risk status of Sleman during the pandemic and the availability of local facilities that supported compliance.

Bivariate Analysis

Bivariate analysis was conducted to examine the relationship between thermal comfort perception and adherence to health protocols, specifically mask-wearing during the COVID-19 pandemic. Kendall's Tau correlation, a non-parametric statistic suitable for ordinal data, was used to assess the strength and direction of the relationship (Sugiyono, 2019).

Crosstabulation results revealed that among respondents who felt comfortable with the thermal environment, 369 (93.2%) consistently adhered to health protocols. Interestingly, even among the 27 respondents who felt discomfort, compliance remained high (6.8%), which may be influenced by gender distribution; females, many wearing hijabs, continued to follow health regulations despite discomfort.

The correlation coefficient was 0.733, indicating a strong positive relationship between thermal comfort perception and mask-wearing compliance. The relationship was statistically significant at a 0.05 level ($p < 0.05$), suggesting that the hypothesis is accepted. A positive correlation implies that as perceived thermal comfort increases, compliance with mask-wearing also increases. This finding is consistent with behavioral observations during the pandemic, where mask usage was primarily influenced by regulatory requirements in public and workplace settings, rather than individual comfort levels.

In conclusion, the study demonstrates that thermal comfort perception significantly correlates with mask-wearing compliance. Even when discomfort occurs due to heat or other environmental factors, respondents maintained adherence to health protocols, highlighting the influence of social norms and regulatory enforcement on protective behaviors during the COVID-19 pandemic.

CONCLUSIONS

Based on the results of the study conducted in Caturtunggal Village, Depok, Sleman, involving 396 respondents, it can be concluded that the hypothesis was accepted. This is because the Sig. (2-tailed) value was 0.14, which is greater than 0.05, indicating a significant correlation between the two variables. The Correlation Coefficient obtained in this study was 0.733, indicating a strong correlation. Overall, the correlation was positive, meaning that both variables are positively related. The analysis shows that there is a significant relationship between thermal comfort perception and mask-wearing compliance during the COVID-19 pandemic in Caturtunggal Village. This is evidenced by the respondents who reported discomfort while wearing masks but still adhered to health protocols. In summary, based on the Kendall's Tau correlation test, it can be concluded that the relationship between thermal comfort and mask-wearing compliance is significant, strong, and positively directed.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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