

# Postpartum Hemorrhage and its Associated Factors Among Women who Gave Birth at Yirgalem General Hospital, Sidama Regional State, Ethiopia

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## Abstract

**Background:** Globally, postpartum hemorrhage (PPH) is one of the leading causes of maternal mortality. In developing countries, it accounts for more than 30% of all maternal deaths. So, understanding its burden in the health care setting is significant. Thus, this study aimed to assess the magnitude of PPH and its associated factors among women who gave birth at Yirgalem General Hospital, Sidama Region, Ethiopia.

**Methods:** A cross-sectional study was conducted from March 12 to 26, 2020 among randomly selected 298 women. Data were collected using an interviewer-administered, structured, and pretested questionnaire. EpiData version 3.1 and SPSS version 20 were used to enter and analyze the data, respectively. Descriptive statistics, bivariable, and multivariable logistic regression analysis were done. Adjusted odds ratio with 95% confidence interval (CI) was used to measure the presence and strength of association between the independent and the outcome variables. A *P*-value  $\leq .05$  was considered to declare statistical significance.

**Result:** The magnitude of PPH was 9.4% [95% CI: 6.0, 12.8]. Prolonged labor ( $\geq 24$  h) [AOR = 3.4, 95% CI: 1.1, 9.9], giving birth by cesarean section [AOR = 5.8, 95% CI: 1.1, 22.0], and instrumental vaginal delivery [AOR = 3.7, 95% CI: 1.1, 12.7], and having a history of the uterine atony [AOR = 4.8, 95% CI: 1.4, 16.6] during their last delivery were factors significantly associated with PPH.

**Conclusion:** The magnitude of PPH was high. Healthcare professionals should manage the progress of labor and take all necessary measures at right time. Also, giving attention to the safety of delivery-related procedures and early related potential risks is crucial.

## Keywords

postpartum hemorrhage, Yirgalem, Ethiopia

## Background

According to the World health organization (WHO), postpartum hemorrhage (PPH) is defined as the blood loss of more than 500 mm following a vaginal delivery or more than 1000 mm following cesarean section. Also, it is defined as any amount of vaginal bleeding following delivery that causes vital sign derangement or loss of 10% hemoglobin from the baseline.<sup>1</sup>

PPH is termed as primary when it occurs within 24 h of delivery, whereas termed late or secondary PPH when it occurs after 24 h to 6 weeks of delivery.<sup>2,3</sup>

PPH is the major cause of maternal mortality and morbidity across the world, responsible for more than 25% of deaths

annually. WHO statistics suggested that 60% of maternal deaths in developing countries were due to PPH, accounting for more than 100,000 maternal deaths per year worldwide.<sup>4</sup>

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PPH remains the leading cause of maternal mortality, exacting huge tolls on economic and human capital, particularly in those countries with inadequate resources. Also, it causes serious consequences like severe anemia, shock, and death particularly in poor countries where women do not have access to quality health care services due to financial constraints.<sup>5</sup>

The major risk factors that contribute to PPH are uterine atony (failure of the uterus to contract adequately after childbirth) and a prolonged third phase of labor, retained placenta, maternal age of above 35 years, gestational age below 37 weeks or above 41 weeks, pregnancy-induced hypertension, anemia, having previous history of PPH, uterine rupture, abruptio placenta, placenta previa.<sup>6,7</sup>

Similarly, the number of pregnancy, mode of delivery (cesarean section), not attending antenatal care during pregnancy, not receiving adequate iron–folate supplementation, episiotomy, and any tear or injury to genital tract are factors related to manifestation of PPH.<sup>8–10</sup>

In African and Asian countries, where most maternal deaths occurred, PPH alone accounts for more than 30% of all maternal deaths. However, the figures of maternal death attributed to PPH differ when compared between low-income and developed countries.<sup>11</sup> In Sub-Saharan Africa, the probability of dying during child birth is significantly higher, and uterine atony (failure of the uterus to contract adequately after childbirth) accounting for 60% to 80% of PPH cases.<sup>12,13</sup>

The high magnitude of PPH and its bad outcome is still a major health problem in developing countries including Sub-Saharan African countries. Ethiopia is one of the countries with a high burden of postpartum maternal morbidity.<sup>14</sup> It was revealed that the main cause of maternal death in poor settings is hemorrhage (54%) that occurs after delivery followed by pregnancy-induced hypertension (20%).<sup>15</sup>

Although reducing maternal mortality continues as the most challenging issue of the health system in Ethiopia, there are efforts to address the profound inequities in maternal and perinatal health.<sup>16</sup> The government of Ethiopia provides free maternal and pre-delivery services regardless of social and economic status of the women. However, still maternal mortality ratio remains high, and PPH is the leading cause of the morbidity and mortality in the country.<sup>17</sup>

In addition, the Ethiopia Federal Ministry of Health has applied multi-direction approaches to improve access to and strengthen facility-based maternal health care services as a strategy to reduce high burden of postpartum maternal morbidity and mortality.<sup>18,19</sup>

Even though there is a decline in maternal mortality from time to time, in Ethiopia it is still high as 412 per 100,000 live births.<sup>20</sup> As the study revealed, shortage of skill birth attendant, inadequate blood supply, lack of ambulance, and poor-quality services at facilities are some of the challenges to prevent and early treatment of PPH in low-resource settings.<sup>18</sup>

The risk of maternal death from PPH represents one of the greatest challenges in global health. Assessing the prevalence of PPH and identifying its risk factors could help to prevent and control its negative consequences. Also, it could have

paramount implications to focus target group as well as reduce the cost of its consequence. To address these problems, there is need for strategies that are based on evidence from different health care settings and situations.<sup>15,16</sup>

Additionally, giving more emphasis on potential risk factors that contribute to PPH and related complications is significant to reduce its burden, particularly in poor countries. As a result, more understanding about the burden of PPH in health care setting is important to prevent and control its consequences.<sup>11,13</sup>

Despite of this, there are inadequacy of literature regarding the extent of PPH and its contributing factors in Ethiopia including the study setting. Therefore, this study aimed to assess the magnitude of PPH and its associated factors among women who delivered at Yirgalem General Hospital, Sidama Regional State, Ethiopia in 2020.

## Methods

### Study Setting and Period

This study was carried out in Yirgalem General Hospital which is found in the Sidama Regional State, Ethiopia. It is located 322 km south of Addis Ababa and 47 km from Hawassa City. The hospital provides preventive, curative, and diagnostic services to the catchment population of 5.2 million. The hospital contains different departments, and is staffed with 13 specialist doctors, 49 general physicians, 36 midwives, and with other health professionals. Obstetrics ward is one of the major departments that serve around 2964 clients per year.

### Study Design, Period, Sample Size Determination, and Population

A facility-based cross-sectional study was conducted from March 12 to 26, 2020. The sample size was determined using single population proportion formula with the following assumption: taking prevalence of PPH 16.6% from the previous study,<sup>21</sup> 95% confidence interval (CI), and 4% marginal of error. A 1-year recorded data (from July 1, 2018 to June 30, 2019) in Yirgalem General Hospital showed that the number of mothers who delivered in the hospital was 2935. To obtain the final sample, finite population correction formula was considered. Accordingly, the final sample size calculated for this study was 298.

All women who gave birth at Yirgalem General Hospital from July 1, 2018 to June 30, 2019 were source population. All selected records of women that fulfilled eligibility criteria were considered as the study population. All maternal records found in the delivery registration logbook during the study period were included. However, maternal records with incomplete/missed information were excluded.

### Sampling Procedures

In Yirgalem General Hospital, there were a total of 2935 deliveries from July 1, 2018 to June 30, 2019. All unique medical

registration numbers of clients who gave birth in the last 1 year were selected from Gynecology and obstetrics ward, and sorted accordingly. Finally, a simple random sampling technique was used to select the study subjects.

### Data Collection Tools, Procedures, and Quality Assurance

Data were collected using an interviewer-administered structured questionnaire. The registration logbooks and individual cards were used to retrieve important information. The tool also contained sociodemographic factors, obstetrics factors, and maternal health related or medical history. Two nurses were assigned as data collectors. One Bachelor of Science midwife was assigned as a supervisor. Cases were identified from the clinical records office through reviewing all records. Finally, the data collection process was supervised by the assigned supervisor and the principal investigator was guiding the overall activities.

To assure the quality of data, training was given to the data collectors and supervisor for 1 day. A pretest was conducted on 5% of the sample in other hospitals. Based on the pretest, the necessary modification was made. The data collectors were instructed to write card numbers on the checklist during data collection. So that any identified error was traced back using the card numbers. The filled checklist was checked for its completeness by the Principal investigator on a daily basis.

### Data Processing and Analysis

The collected data were coded and entered into EpiData version 3.1 and exported to SPSS version 20.0 for further analysis. Descriptive statistics were used to describe the study subjects. Frequencies and cross-tabulations were used to check for missed values and variables. Bivariable analysis was used primarily to check which variables were associated with the dependent variable.

Variables with a *P*-value of  $<.25$  in the bivariate analysis were entered into multivariable logistic regression model. Multivariable logistic regression with odds ratio and 95% CI was used to measure factors associated with the outcome variable, and control for possible confounders.

To assess the goodness of fit of the final model, Hosmer and Lemeshow goodness-of-fit test was checked to see good fitness. To check the multicollinearity effect, variance inflation factor less than 10 and tolerance test greater than 0.1 was considered. A *P*-value  $\leq .05$  was considered to declare statistical significance. Finally, the results were presented using texts, tables, and figures.

### Variables

For this study, the outcome variable was PPH (yes or no) based on a clinician's diagnosis. The independent variables were sociodemographic (residence, maternal age, marital status, occupation), obstetric history (parity, gravidity, ANC utilization, status of labor, uterine atony, retained placenta, mode of delivery, and

previous PPH), and maternal health-related factors (anemia, preeclampsia, pregnancy-induced hypertension, different infections)

### Operational Definitions

PPH: according to this study, a PPH was considered based on a clinician diagnose who attended the delivery that was obtained from the women's records/cards.

Current history uterine atony: failure of the uterus to contract adequately after childbirth according to a clinician's diagnosis.

Prolonged labor: according to this study, it was defined as delayed labor for more than 24 h.

## Results

### Sociodemographic Characteristics of the Study Participants

A total of 298 woman charts were reviewed in this study. About 187 (62.8%) of them were aged 20 to 34 years with a mean age of 25.7 ( $\pm 5.6$ ) years. Majority of them (96.6%) were married. In terms of occupational status, 149 (50%) were housewives (Table 1).

### Obstetrics-Related Characteristic of the Study Participants

About 207 (69.5%) were multiparous. Majority (81.2%) had a history of ANC follow-up for their last pregnancy. Concerning the mode of delivery, 247 (82.9%) was spontaneous vaginal delivery. Fifty five (18.5%) had history of prolonged labor, 58 (19.5%) had history of delivery with episiotomy, and 21(7%) had history of

**Table 1.** Sociodemographic Characteristics of Women who Gave Birth at Yirgalem General Hospital, Sidama Regional State, Ethiopia, 2020.

| Variable (n = 298)  | Frequency | Percentage |
|---------------------|-----------|------------|
| Age in years        |           |            |
| <20                 | 72        | 24.2       |
| 20 to 34            | 187       | 62.8       |
| $\geq 35$           | 39        | 13.0       |
| Residence           |           |            |
| Urban               | 108       | 36.2       |
| Rural               | 190       | 63.8       |
| Marital status      |           |            |
| Married             | 288       | 96.6       |
| <sup>a</sup> Others | 10        | 3.4        |
| Occupation          |           |            |
| Housewife           | 149       | 50         |
| Merchant            | 90        | 30.2       |
| Government employee | 54        | 18.1       |
| <sup>b</sup> Others | 5         | 1.7        |

<sup>a</sup>Others: single, divorced, and widowed.

<sup>b</sup>Others: farmer and others.

uterine atony. Regarding onset of the labor, 12 (4%) was induced, and the main reason was hypertensive disorders (preeclampsia and eclampsia) (Table 2).

### The Magnitude of PPH, and Other Medical and Obstetrics Complications

In this study, the magnitude of PPH was 9.4% (95% CI: 6.0, 12.8). About 66 (20.5%) had history of medical illness during their last pregnancy. Of which, 27 (43.3%) had anemia followed by urinary tract infections (39.3%). Twenty nine (9.7%) had history of hypertensive disorder during their last

**Table 2.** Obstetric Characteristics of Women who Gave Birth at Yirgalem General Hospital, Sidama Regional State, Ethiopia, 2020.

| Variable (n = 298)                   | Frequency | Percentage |
|--------------------------------------|-----------|------------|
| History of antenatal care            |           |            |
| Yes                                  | 242       | 81.2       |
| No                                   | 56        | 18.8       |
| Parity                               |           |            |
| Primipara                            | 91        | 30.5       |
| Multipara                            | 207       | 69.5       |
| History of current obstructed labor  |           |            |
| Yes                                  | 61        | 20.5       |
| No                                   | 237       | 79.5       |
| On set of labor                      |           |            |
| Spontaneous                          | 286       | 96.0       |
| Induced                              | 12        | 4.0        |
| Duration of labor                    |           |            |
| <24 h                                | 243       | 81.5       |
| ≥24 h                                | 55        | 18.5       |
| Delivery with episiotomy performed   |           |            |
| Yes                                  | 58        | 19.5       |
| No                                   | 240       | 81.5       |
| Mode of delivery                     |           |            |
| Vaginal delivery (SVD)               | 247       | 82.9       |
| Cesarean section                     | 22        | 7.4        |
| Instrumental delivery                | 29        | 9.7        |
| Duration of third stage labor        |           |            |
| ≤30 min                              | 235       | 78.9       |
| >30 min                              | 63        | 21.1       |
| Current history of retained placenta |           |            |
| Yes                                  | 38        | 12.8       |
| No                                   | 260       | 87.2       |
| Current history of uterine atony     |           |            |
| Yes                                  | 21        | 7          |
| No                                   | 277       | 93         |
| History of previous PPH              |           |            |
| Yes                                  | 51        | 17.1       |
| No                                   | 247       | 82.9       |
| Current antepartum hemorrhage        |           |            |
| Yes                                  | 26        | 8.7        |
| No                                   | 272       | 91.3       |

Abbreviations: PPH: postpartum hemorrhage; SVD: spontaneous vaginal delivery.

pregnancy. Majorities (98.7%) were screened for HIV, and out of them, 0.3% were seropositive (Table 3).

### Factors Associated with Postpartum Hemorrhage

In the bivariable logistic regression analysis age of the woman, ANC follow-up, previous history of PPH, mode of delivery, duration of labor, delivery with episiotomy, and current history of uterine atony were associated with the outcome variable.

However, in multivariable logistic regression analysis, duration of labor, uterine atony, and mode of delivery (cesarean section and instrumental vaginal delivery) were factors significantly associated with PPH.

Women who had history of the prolonged labor (≥24 h) were 3.4 [AOR = 3.4, 95% CI: 1.1, 9.9] times more likely to have PPH when compared with those who had less than 24 h duration of labor.

Those women who gave birth by cesarean section were 5.8 [AOR = 5.8, 95% CI: 1.1, 22.0] times, and instrumental vaginal delivery 3.7 [AOR = 3.7, 95% CI: 1.1, 12.7] times more likely developed PPH when compared to those who gave birth by spontaneous vaginal delivery.

Similarly, women who gave birth by instrumental vaginal delivery were 3.7 [AOR = 3.7, 95% CI: 1.1, 12.7] times more likely to develop PPH when compared to those who gave birth by spontaneous vaginal delivery.

This study also examined that the likelihood of developing PPH was 4.8-folds [AOR = 4.8, 95% CI: 1.4, 16.6] higher among women who had experienced uterine atony (Table 4).

**Table 3.** Medical Illness-Related Characteristics of Women who Gave Birth at Yirgalem General Hospital, Sidama Regional State, Ethiopia, 2020.

| Variable                                     | Frequency | Percentage |
|--|-----------|------------|
| History of current medical illness (n = 298) |           |            |
| Yes  | 61        | 20.5       |
| No   | 237       | 79.5       |
| Type of current medical illness (n = 61)     |           |            |
| Anemia                                       | 27        | 44.3       |
| UTI  | 24        | 39.3       |
| Malaria                                      | 9         | 14.8       |
| Diabetes mellitus                            | 1         | 1.6        |
| Have hypertensive disorder (n = 298)         |           |            |
| Yes  | 29        | 9.7        |
| No   | 269       | 90.3       |
| Type of hypertensive disorder (n = 29)       |           |            |
| Preeclampsia                                 | 17        | 60.7       |
| Eclampsia                                    | 7         | 25         |
| Gestational HTN                              | 4         | 14.3       |
| Screened for syphilis (n = 298)              |           |            |
| Yes  | 271       | 90.9       |
| No   | 27        | 9.1        |

Abbreviations: HTN: hypertension; UTI: urinary tract infection.

**Table 4.** Bivariable and Multivariable Logistic Regression Analysis for Factors Associated with PPH Among Women who Gave Birth at Yirgalem Hospital Sidama Regional State, Ethiopia, 2020.

| Variables (n = 298)                     | Postpartum hemorrhage |     | Crude odds ratio (95% CI) | Adjusted odds ratio (95% CI) |
|---|-----------------------|-----|---------------------------|------------------------------|
|   | Yes                   | No  |                           |                              |
| <b>Age group in years</b>               |                       |     |                           |                              |
| <20                                     | 6                     | 66  | 1.2 (0.4,3.3)             | 1.6 (0.3,7.2)                |
| 20 to 34 (ref)                          | 13                    | 174 |                           |                              |
| ≥35 year                                | 9                     | 30  | 4.0 (1.5,10.2)            | 2.1 (0.6,7.3)                |
| <b>History of antenatal care</b>        |                       |     |                           |                              |
| No                                      | 12                    | 44  | 3.8 (1.7,8.7)             | 2.1 (0.7,5.6)                |
| Yes                                     | 16                    | 226 |                           |                              |
| <b>Parity</b>                           |                       |     |                           |                              |
| Multipara                               | 23                    | 184 | 2.1 (0.7,5.8)             | 1.6 (0.3,7.3)                |
| Primipara                               | 5                     | 86  |                           |                              |
| <b>Previous history of PPH</b>          |                       |     |                           |                              |
| Yes                                     | 11                    | 40  | 3.7 (1.6,8.5)             | 1.5 (0.5,4.7)                |
| No                                      | 17                    | 230 |                           |                              |
| <b>Mode of delivery</b>                 |                       |     |                           |                              |
| Instrumental delivery                   | 7                     | 22  | 4.5 (1.7,12.7)            | 3.7 (1.1,12.7)*              |
| Cesarean section                        | 5                     | 17  | 4.2 (1.3,12.9)            | 5.8 (1.5,22.0)*              |
| Spontaneous vaginal delivery            | 16                    | 231 |                           |                              |
| <b>Duration of labor</b>                |                       |     |                           |                              |
| ≥24 h                                   | 16                    | 40  | 7.6 (3.3,17.4)            | 3.4 (1.2,9.9)*               |
| <24 h                                   | 12                    | 230 |                           |                              |
| <b>Duration of third stage labor</b>    |                       |     |                           |                              |
| >30 min                                 | 10                    | 53  | 2.2 (0.9,5.2)             | 1.5 (0.5,4.4)                |
| ≤30 min                                 | 18                    | 217 |                           |                              |
| <b>Episiotomy performed</b>             |                       |     |                           |                              |
| Yes                                     | 12                    | 45  | 3.7 (1.6,8.4)             | 2.3 (0.8,7.0)                |
| No                                      | 16                    | 225 |                           |                              |
| <b>History of current uterine atony</b> |                       |     |                           |                              |
| Yes                                     | 7                     | 15  | 5.6 (2.1,15.4)            | 4.8 (1.4,16.6)**             |
| No                                      | 21                    | 255 |                           |                              |

\* =  $P < .05$ , \*\* =  $P < .001$ , | = reference.

Abbreviations: CI: confidence interval; PPH: postpartum hemorrhage.

## Discussion

Globally, PPH is the major cause of maternal mortality and morbidity, accountable for more than 25% of deaths annually.<sup>4</sup> Subsequently, understanding its burden in the health care setting is important to prevent its negative outcomes.<sup>11,13</sup> Hence, this study attempted to assess the extent of PPH and its associated factors among postpartum women.

Accordingly, the magnitude of PPH was 9.4% [95% CI: 6.0, 12.8] in the study area. This result was comparable with the findings from previous study conducted in central Uganda (9%),<sup>22</sup> Bedele Hospital (9.6%),<sup>14</sup> and Debre Tabor General Hospital (7.6%).<sup>18</sup> However, this finding was lower when compared with the previous study conducted in Cameroon

(23.6%),<sup>23</sup> Pakistan (21.6%),<sup>24</sup> and Ethiopia (16.6%).<sup>25</sup> Meanwhile, our study findings were relatively higher than the previous findings from India (3.4%),<sup>26</sup> Zimbabwe (1.6%),<sup>27</sup> and Ethiopia (5.8%).<sup>28</sup>

The variation might be due to the differences in the study period, socioeconomic status, and upgrading of the health service delivering systems in terms of its availability and accessibility. Furthermore, the difference in the study setting and target population could contribute to this variation. Additionally, upgrading of data recording and documentation system could contribute to this variation.

This study showed that women who had experienced prolonged labor (≥24 h duration of labor) were 3.4 times more likely to develop PPH when compared with those who had less than 24 h duration of labor. Similarly, the study conducted in Bonassama Hospital in Cameroon supports this finding.<sup>24</sup> This finding was also in line with the previous results from Ethiopia.<sup>28,29</sup> Moreover, as our findings supported by different literatures, when the duration of labor increases, the risk of developing PPH also increased.<sup>30</sup>

The possible explanation for this could be that the prolonged labor might increase the risk for a laceration to the blood vessels and soft tissue in the pelvis. This reduces uterine contraction by a significant level. As a result, the chance of losing blood after delivery could be increased by a substantial amount.

This study also revealed that delivery by cesarean section increased the probability of developing PPH by nearly sixfolds. Similarly, those women who gave birth by instrumental vaginal delivery were four times more likely to develop PPH when compared with those who gave birth by spontaneous vaginal delivery. This finding was in agreement with the previous results.<sup>21,28</sup>

A likely clarification for this might be that conducting a cesarean section could result in an organ cut, injury to the blood vessels, and tear of nearby tissue which make more bleeding. Furthermore, during instrumental vaginal delivery, there is an increased risk for cervical, vaginal and perineal lacerations which increases bleeding tendency later. Thus, those mothers who give birth by these procedures might easily get these risks that increase the chance of facing PPH and its related complications when compared with their counterparts.

The current study also indicated that woman who had history of uterine atony during her last delivery was nearly five times more likely to develop PPH than those who had normal contraction after childbirth. This finding was in line with previous reports from different settings.<sup>24,26,30</sup>

That might mainly happen because of many conditions that interfere with uterine contraction, such as retained placenta or retained small remnants of placental tissue, and blood clots could profoundly diminish contractility of the uterine muscle. That could lead to potentially heavy bleeding. In addition to this, physiological changes (cardiovascular changes) that occur during pregnancy and childbirth could also contribute to this problem.

## Limitations of the Study

The study might not be a real representative of the catchment area since women who received delivery services other than this hospital were not included. Since we used secondary data, we could not address cultural practices and social believes of the client. Also, factors related to the health system and the service providers were not addressed.

## Conclusion

The magnitude of PPH was 9.4% in the study setting. Prolonged labor, giving birth by cesarean section and instrumental vaginal delivery as well as having a history of uterine atony were factors significantly associated with PPH.

Healthcare professionals should manage the progress of labor and take all necessary measures at right time. Additionally, attention should be given to the safety of delivery-related procedures to reduce the risk of damaging other adjacent organs. Also, early recognition of potential risks for pregnancy-related complications, and following all suggested guidelines for interventions are key actions to decrease the probability of getting PPH. Further study is recommended with a consideration of factors related to the health system, service providers, and cultural aspects.

## Authors' Contribution

TA made considerable contributions to the conception, design, acquisition, analysis, and interpretation of the result. AD and AD contributed to analysis, interpretation of the result, drafting and revising the final document. All authors read and gave final approval of the version to be published.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## Ethics Approval and Consent to Participate

Ethical clearance was obtained from the Institutional Review Board of the Hawassa University College of Medicine and Health Science. Official permission letters were obtained from Yirgalem General Hospital. The purpose of the study also was informed to the manager, staff members, and all responsible body who are working at Yirgalem General Hospital.


## Availability of Data and Materials


The finding of this study is generated from the data collected and analyzed based on stated methods and materials. The original data supporting this finding are available from the corresponding author on reasonable request.

## Consent to Publish

Not applicable.

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