Magnitude and determinants of knowledge towards pregnancy danger signs among pregnant women attending antenatal care at Chiro town health institutions, Ethiopia

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Abstract

Objectives: This study aimed to assess the magnitude and determinants of knowledge of pregnancy danger signs in Chiro town health institutions, Ethiopia.

Methods: Institutional-based cross-sectional study was conducted among 395 systematically selected pregnant mothers. An interviewer-administered pretested questionnaire was used to collect data. The data were entered into EPI data version 3.1 and analyzed using SPSS version 22. Bi- and multivariate logistic regression analyses were used to identify determinant factors. Statistical significance was declared at $p < 0.05$.

Results: Even though 58.0% of respondents recalled at least one danger sign of pregnancy, only 26.3% (95% confidence interval: 21.7–30.7) of the respondents had good knowledge of pregnancy danger signs. Residence (adjusted odds ratio = 2.43, 95% confidence interval: 1.50–4.00), distance to health facility (adjusted odds ratio = 2.11, 95% confidence interval: 1.28–3.47), and income (adjusted odds ratio = 1.99, 95% confidence interval: 1.22–3.33) were found to be significantly associated with mothers' knowledge of pregnancy danger signs.

Conclusion: The overall women's knowledge of the danger signs of pregnancy was poor. Monthly income, distance to health facilities, and residence were determinant factors of mothers' knowledge of pregnancy danger signs. Thus, the provision of information targeting pregnant women, their families, and the general community regarding danger signs of pregnancy is recommended to health care providers.

Introduction

The maternal mortality rate remains a global problem; however, various efforts to reduce the maternal mortality rate have been carried out across countries worldwide, and the progress in the reduction of the number of deaths was too slow.[1,2] Globally, about 810 women died every day from preventable causes related to obstetric complications.[1] Hemorrhage alone accounts for one-third of all maternal deaths in Africa. In 2019, approximately, 99% of the global maternal deaths occurred in developing countries with the majority of these deaths occurring in sub-Saharan Africa where the majority of women lack knowledge about obstetric danger signs.[3,4]

Multiple factors cause maternal mortality. The direct causes of maternal death include complications during pregnancy, childbirth, and postpartum. Most of these complications occur during pregnancy, but others may exist before

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pregnancy and become worse during pregnancy.[2] A normal pregnancy may be accompanied by some problems and complications that are potentially life-threatening to the mother and/or fetus.[5] The danger signs are not actual obstetric complications, but symptoms that are easily identified by non-clinical personnel. The key danger signs of pregnancy include persistent vomiting, severe abdominal pain, vaginal bleeding during pregnancy, delivery and after birth, swelling of the face, feet, blurring of vision, severe headache, high-grade fever, marked change in fetal movements, high blood pressure, and a sudden gush of fluid from the vagina fits during pregnancy.[6]

Knowledge of pregnancy danger signs is the first essential step in receiving appropriate and timely referral to maternal and newborn care.[7] Poor knowledge of danger signs is one of the most common causes of failure to recognize the complication when it occurs and delay in the decision to seek care.[8] Unable to recognize the danger signs of pregnancy causes adverse effects to the mother and unborn baby or the pregnancy itself. If not attended, this can lead to neonatal morbidity and mortality, termination of pregnancy before term.[9] Evidence suggests that raising women's awareness about obstetric danger signs would improve early detection of problems and reduce the delay in deciding to seek obstetric care.[5] Pregnant women and their families need to have adequate knowledge of obstetrical danger signs to enable them to respond appropriately to complications that may arise because informed women will be in a better position to make reasonable and on-time decisions.[3,10]

Previous studies have indicated that the level of maternal mortality and morbidity in Ethiopia is among the highest in the world because of a lack of information on danger signs during pregnancy.[5,11] Based on the results of the "Bayesian multilevel model" study conducted in Ethiopia, the probability of maternal mortality for Afar and Somali was high as compared to the other regions, and also the number of maternal mortality for urban women is less likely than that of rural.[11] In Ethiopia, the mothers' knowledge level of pregnancy danger signs ranges from 13% to 82.5%, in which the lowest and highest proportions are reported from Robe district[12] and Mekelle City.[13]

The Ethiopian national reproductive strategy emphasizes to empower pregnant women, their families, and communities in the identifications of pregnancy-related risks, and to take appropriate and timely intervention.[14] According to this strategy, increasing the community's awareness of the importance of early recognition of pregnancy danger signs and complication readiness will be important in reducing the maternal mortality ratio from 353 to 199 per 100,000 live births by 2020.[15]

Despite the above-mentioned governmental efforts, maternal morbidity and mortalities remain high in Ethiopia. This might be mainly attributed to a lack of early recognition of danger signs of pregnancy and delayed health-seeking behavior. Therefore, it is very important to understand the knowledge level of pregnant mothers toward danger signs of pregnancy. Since existing studies are focused only on the knowledge level of health professionals, maternal knowledge of danger signs during pregnancy has been undermined. Moreover, most of the available studies were conducted at a single institution. Therefore, this study aimed to assess the magnitude and determinants of knowledge of danger signs of pregnancy in Chiro town health institutions, Ethiopia.

Methods and materials

Study period and setting

The study was conducted from 28 September to 28 October 2020, at Chiro town health institutions, which are found in West Hararghe Zone, Oromia Region, Ethiopia. Chiro town, located 326 km away from Addis Ababa, is the administrative center of the West Hararghe Zone. The total population of Chiro town is 57,873 according to the central statistical agency of Ethiopia (CSAE), 2016.[16] In the town, there are around 18,172 reproductive age women and the expected umber of pregnant women was 909.[17] There is one public health center, one non-governmental clinic called the family guidance association (FGA), and one general hospital that offers antenatal care (ANC) services and other maternal health packages. Chiro hospital is the only general hospital in the town providing care for 1,105,813 populations. According to the 2019 report of the Chiro health bureau, the antenatal coverage of the town reached 54.56%.[17]

Study design and population

An institutional-based cross-sectional study design was applied. All systematically selected pregnant women who were attending ANC service in Chiro town health facilities (Chiro general hospital, FGA, and Chiro health center) during the study period were included in the study. Those who were mentally ill and were unable to respond to the questionnaire because of serious illness or impaired cognition during the data collection period were not included in the study.

Sample size determination and sampling procedure

The sample size was determined using a single population proportion formula using the assumptions of confidence level at 95% = 1.96, sampling error = 5%, proportion of 37.3% from a previous study conducted in the Illu Ababor zone, Ethiopia[18] and by adding 10% non-response rate, the final sample size was 395.

A systematic sampling method was employed to select study subjects. First, all health facilities providing ANC services in the town were identified and included in the study. Those health facilities that had been providing ANC services in Chiro were Chiro general hospital, FGA, and Chiro health

center. The sample size was distributed in proportion to the average monthly caseloads of pregnant women who followed their ANC follow-up at each health facility. The total sample size was allocated proportionally to all selected health institutions in Chiro town according to the number of pregnant women attending ANC services in the respective health facilities.

The pregnant women who are eligible for the study were recruited using the *k*-value interval (*K=N/n: N*—total monthly caseload of pregnant mothers on ANC follow-up in each health facility and n=sample sizes for each health facility), based on each health facilities monthly report (*k*=351/153~2, *K*=322/140~2, and *K*=236/103~2; for Chiro general hospital, FGA, and Chiro health center, respectively). The first pregnant mother was selected using the lottery method and then every second pregnant woman attending ANC follow-up was recruited as study participants in each health facility until the total sample size for the study was obtained.

Data collection methods

A structured questionnaire was adapted from previous studies and modified based on the study variables and local context.[3,4,19–22] The pilot study was conducted on 10% of the total sample size at two health facilities that were not included in the study to ensure the questionnaire validity to a local context, clarity, wording, and logical sequences. The amendments to the questionnaire were made after the pilot study accordingly. The questionnaire was translated to the Afan Oromo language for a better understanding of the enumerators and study participants to maintain consistency. Then, it was translated back into English for analysis. The questionnaire consists of four sections: socio-demographic factors, obstetric-related factors, knowledge-related factors, and health service–related factors.

The pregnant mothers were interviewed/asked to recall the common danger signs in pregnancy without prompt. The data were collected through face-to-face interviews using the adapted and piloted questionnaire. The data were collected by well-trained five diploma midwifery professionals and supervised by two Bachelors of Science (BSc) midwifery professionals. The principal investigator and the supervisors have strictly followed the overall activities daily to ensure the completeness and consistency of the questionnaire.

Study variable

Dependent variable. Knowledge of pregnant women on pregnancy danger signs.

Independent variables

Socio-demographic factors. Age, marital status, family size, residence, religion, maternal educational level, maternal occupation, husband occupation, monthly income, and walking distance to a health facility.

Obstetric and health service–related factors. Parity, gravidity, stillbirth, miscarriage, and live birth, previous delivery assistant, and place of previous delivery.

Operational definition and measurement

Pregnancy danger signs. Danger signs during pregnancy refer to alerts of obstetric-related complications that occur commonly in the middle and late pregnancy.[23] The key danger signs were severe per vaginal bleeding, high-grade fever, no or reduced fetal movement, convulsions, swollen hands, face, feet, or ankles, headache, leaking of fluid from the vagina, and troubled with blurred vision.[23]

Good knowledge of pregnancy danger signs. Women who answer at least three danger signs of pregnancy from eight items are categorized as having good knowledge.[4,24–27]

Poor knowledge of pregnancy danger signs. Women who answer less than three danger signs of pregnancy are categorized as having poor knowledge.[4,24–27]

The mothers' knowledge level was coded by "1" for those who have mentioned at least three danger signs of pregnancy, while those who mention less than three danger signs were coded as "0."

Data quality control

The questionnaire was first prepared in English and then translated to Afan Oromo language, and then back to English by two different individuals with language experts, which is helpful to maintain the consistency of the questionnaire. Two days of training were given for data collectors and supervisors about the objectives of the study and each component of the questionnaire. After the training was given, pilot study was conducted on 10% of the sample size on the nearest town (Hirna), then correction was made accordingly. The principal investigator and supervisors were checking on the spot and reviewed all the questionnaires to ensure the completeness and consistency of the information collected and immediate action was taken accordingly. Double data entry was done by two data clerks independently and the consistency of the entered data was cross-checked by comparing the two separately entered data.

Statistical analysis

After checking for completeness, the data have been edited, coded, and entered into EPI data version 3.1 software and exported to SPSS version 22 software for analysis. The characteristics of study participants were explored using frequency, percentage, figure, and descriptive summaries to describe the study variable using bivariate analysis. Multivariable logistic regression analysis was done to see the independent effect of each variable on the outcome variable. Variable with *p*-value < 0.25 in the bivariate analysis

Table 1. Socio-demographic/economic characteristics of pregnant women attending ANC follow-up in Chiro town health facilities, Ethiopia, 2020.

Variables (n = 395)	Categories	Frequency	Percentage
Age	10–19	45	12.4
	20–29	256	70.3
	Above 30	94	25.8
Residence	Urban	229	58.0
	Rural	166	42.0
Family size	<3	304	77.0
	>3	91	23.0
Religion	Muslim	250	63.3
	Orthodox	106	26.8
	Protestant	39	9.9
Marital status	Married	364	92.0
	Not married	31	8.0
Occupation	Housewife	244	61.8
	Merchant	90	22.8
	Government employee	61	15.4
Husband occupation (n = 364)	Farmer	152	42.0
	Merchant	78	21.0
	Government employee	134	37.0
Educational status	No formal education	110	28.0
	Primary level	136	34.0
	Secondary and above level	149	38.0
Monthly income	≤4000 ETB	266	67.4
	>4000 ETB	129	32.6

ETB: Ethiopian birr.

were exported to the multivariable analysis. Multicollinearity was checked using the variance inflation factor (VIF), and those with VIF greater than 10 were excluded from the model and no multicollinearity was found, since the result was in the range of VIF = 1–10 or tolerance = 0–1. The goodness of fit was tested by Hosmer–Lemeshow statistic and Omnibus tests. The direction and strength of statistical association were measured by odds ratio with 95% confidence interval (CI). Finally, statistical significance was declared at a p-value < 0.05.

Ethical considerations

Ethical clearance was obtained from the institutional health research ethics review committee (IHRERC) of the College of Health and Medical Sciences, Haramaya University with an approval number of IHRERC/214/2020. A written permission letter was obtained from the West Hararghe zonal health office, Woreda health office and all the heads of all health facilities. The information, including the possible risk, benefit, confidentiality, privacy, their voluntary activity, right of withdrawal, and the time the interview might taking was informed to the respondents. Written informed consent was obtained from all subjects who were ≥18 years old before the study and written informed consent was obtained

from legally authorized representatives for subjects below 18 years old before the study. For all study participants, information was given about COVID-19 preventive measurements, data collectors, and participants were told to wear a face mask, use sanitizer, and keep their distance greater than two meters from each other.

Result

Socio-demographic and economic characteristics

A total of 395 study participants aged between 15 and 49 years were involved with a response rate of 100%. The mean ($\pm$ SD) age of the study participants was 25.3 ($\pm$ 5.20). Of the total study participants, 136 (34%) were completed secondary school and above, and 229 (58%) were urban dwellers (Table 1).

Obstetrics and health-related characteristics

Among the total study participants, 160 (40.5) were multipara and 104 (41.6%) of them had delivered less than three alive births. About 70 (28%) of them delivered their last child at home. Almost 154 (39%) of the mothers were expected to walk for more than 30 min to reach the nearby health institutions (Table 2).

Table 2. Obstetrics and reproductive characteristics among pregnant women attending ANC follow-up in Chiro town health facilities, Ethiopia.

Variables (n = 395)	Categories	Frequency	Percentage
Gravidity	Primigravida (1)	110	27.8
	Multigravida (2–4)	189	47.8
	Grand multigravida (≥5)	96	24.4
Parity	Primipara	145	36.7
	One	90	22.8
	≥Two	160	40.5
Miscarriage	No miscarriage	315	79.8
	One	50	12.7
	>Two	30	7.5
History of stillbirth	No	234	94.0
	Yes	16	6.4
Alive birth (n = 250)	<3	104	41.6
	>3	146	58.4
A delivery place for the last child (n = 250)	Health institution	180	72.0
	Home	70	28.0
Walking time to a nearby health facility	<30 min	241	61.0
	≥30 min	154	39.0

Magnitude on knowledge of danger signs of pregnancy

Of the total (395) of study participants, 230 (58.0%) of them said, "yes" to the question "do you know about danger signs of pregnancy?" Approximately, 26.3% (95% CI: 21.7–30.7) of them know three or more pregnancy danger signs. Vaginal bleeding is the most 136 (59.0%) frequently recalled danger sign of pregnancy among pregnant mothers (Figure 1).

Determinants of knowledge toward danger signs of pregnancy

Variables with $p < 0.25$ in the bivariate model were entered into a multivariate model to control the confounders. Twenty variables were entered for bivariate analysis, then seven of the variables (age, occupation, educational status, residence, miscarriage, walking distance to reach health facility, and income) were significantly associated with good knowledge of pregnancy danger signs through bivariate logistic regression analysis. However, after controlling confounders in the multivariate logistic regression, residence, walking time to a health facility, and income, were remained to be statistically significant factors.

The odds of good knowledge of danger signs of pregnancy were high among mothers living in urban areas as compared to rural residents (adjusted odds ratio (AOR) = 2.43, 95% CI: 1.50–4.00, $p = 0.002$). Those mothers who walked for <30 min to reach a nearby health facility were more likely to have good knowledge of danger signs during pregnancy than their counterparts (AOR = 2.11, 95% CI: 1.28–3.47, $p = 0.014$). The level of good knowledge of pregnancy danger signs was about two times (AOR = 1.99, 95%
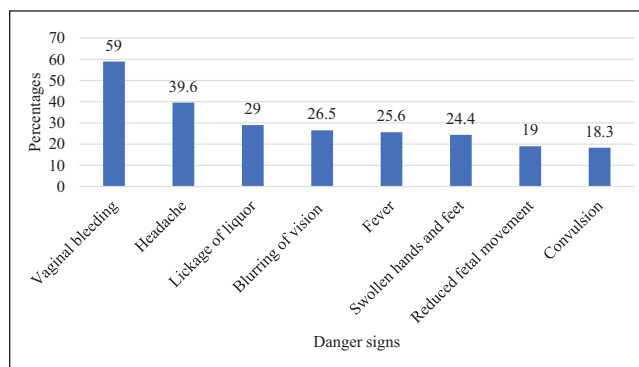

Figure 1. Knowledge of danger signs of pregnancy among pregnant women attending ANC follow-up in Chiro town health facilities, Ethiopia.

CI: 1.22–3.33, $p = 0.002$) higher among respondents who had a monthly income of ≥4000 Ethiopian birr (ETB; Table 3).

Discussion

In general, 26.3% of the respondents had good knowledge of danger signs during pregnancy. Residence, monthly income, and distance to health facilities were factors found to be significantly associated with good knowledge of danger signs during pregnancy.

This is in harmony with the study conducted in Tanzania (26%),[28] Yirgacheffe town, Ethiopia (21.9%),[29] and Nepal 21%.[10] However, our finding is higher as compared to the study conducted in the Western part of Kenya at 4.7%.[30] This difference might be due to socio-cultural differences and differences in the implementation of health programs.

Table 3. Multivariate analysis of determinants of knowledge about pregnancy danger signs in Chiro town health institutions, Ethiopia, 2020 (n = 395).

Variables (n = 395)	Categories	Knowledge		COR 95%	AOR 95%
		Good (%)	Poor (%)		
Residence	Rural	28 (16.8)	138 (83.2)	1	1
	Urban	76 (33.2)	153 (66.8)	2.45 (1.50, 4.00)	**2.43 (1.40, 4.20)***
Age	10–19	10 (22.2)	35 (77.8)	1	1
	20–29	78 (30.5)	178 (69.5)	1.53 (0.72, 3.25)	1.31 (0.58, 2.92)
	Above 30	16 (17.0)	78 (83.0)	0.72 (0.29, 1.73)	0.62 (0.24, 1.57)
Occupational status	Housewife	59 (24.2)	185 (75.8)	1	1
	Merchant	21 (23.3)	69 (76.7)	0.95 (0.53, 1.68)	0.79 (0.43, 1.46)
	Government employee	24 (39.3)	37 (60.7)	2.03 (1.12, 3.67)	1.42 (0.67, 3.02)
Educational status	No formal education	22 (20.0)	88 (80.0)	1	1
	Primary level	31 (23.5)	101 (76.5)	1.23 (0.66, 2.27)	1.12 (0.57, 2.18)
	Secondary and above	51 (33.3)	102 (66.7)	2.0 (1.12, 3.55)	1.21 (0.59, 2.50)
Miscarriage	≥ Two miscarriages	11 (36.7)	19 (63.3)	1	1
	One miscarriage	18 (36.0)	32 (64.0)	0.97 (0.37, 2.49)	1.06 (0.39, 2.89)
	No miscarriage	75 (23.8)	240 (76.2)	0.54 (0.25, 1.18)	0.67 (0.29, 1.53)
Walking distance	≥ 30 min	51 (33.5)	103 (66.5)	1	1
	< 30 min	53 (21.7)	188 (78.3)	1.76 (1.16, 2.87)	**2.11 (1.28, 3.47)***
Income	< 4000 ETB	56 (21.2)	208 (78.8)	1	1
	≥ 4000 ETB	48 (36.6)	83 (63.4)	2.15 (1.35, 3.40)	**1.99 (1.22, 3.33)***

OR: odds ratio; AOR: adjusted odds ratio; CI: confidence interval; ETB: Ethiopian birr.
Bold values indicate the statistically associated with outcome variable.
*Statistically significant with p < 0.05.

The prevalence of knowledge in the current study is considerably lower than previous study reports from a study done in Arba Minch town, which was 68.4%,[5] Nigeria 63.3%,[31] Uganda 60%,[32] and India 73%,[33] as well as the study conducted in Nigeria and Shashamane, which was 43% and 40%, respectively.[22,34] This difference might be due to high home delivery (18%) and variation in the implementation of relevant health intervention programs in the study areas and it might be due to study time variation. Moreover, in this study, mothers were considered as knowledgeable if at least three or more obstetric danger signs were identified, while in some of the other studies, the knowledge of at least one or two danger signs was considered as knowledgable.[5,31,35]

Pregnant women who live in an urban area were more likely to have good knowledge as compared to pregnant women who live in a rural area. This is in line with the study done in Angola[4] and Debre Birhan town, northern Ethiopia.[6] The reason for this might be due to the accessibility of health care centers and exposure to different health care services including higher coverage with health information dissemination. Furthermore, in urban areas, sources of information are unlimited like that of rural areas and the prevalence of better literacy rate in the urban area may be contributed to this result.

Mothers who had a monthly income of ≥ 4000 ETB were more likely to have good knowledge than those who get < 4000 ETB. This finding was in agreement with the findings from a study done in Shashamane, Ethiopia.[22] This might be due to the reason that having a better monthly income motivates the mother to seek obstetrical and medical care services frequently and at any time without worrying about service fees and transportation costs.

Pregnant women who traveled by walk for < 30 min to reach health facilities for ANC service utilization were more likely to have good knowledge about danger signs of pregnancy than those mothers who traveled ≥ 30 min. This is in agreement with the findings from the study done in Goba, Yirgacheffe town, and Addis Ababa, respectively.[25,27,36] This might be due to the accessibility of different health facilities and access to health information for respondents and less transportation cost.

The commonly mentioned danger sign was vaginal bleeding that is identified by 59% of respondents and better than the study conducted in Harar town (29.1%),[37] Nigeria 48.4%,[38] and India 39%,[34] but lower than a study done in Mizan Aman, which is 66.8%,[21] which might be due to difference in socio-demographic characteristics and health intervention activities in the areas. With similar expectation swelling of the hands, face and body were considered as danger signs in 24% of the respondent, which is consistent with the study done in India, which was 27.5%,[34] Mizan Aman 23.9%,[21] and lower than the study conducted in Arba Minch town, which was 82%.[5] The reason might be the time gap between the studies, since there is a progressive change in maternal health intervention strategy over time.

About 19% of the respondents were aware of fetal movement as danger signs of pregnancy, which is consistent with a study done at Debre Birhan town (21.7%),[6] but lower than

that of the study conducted at Arba Minch town, which is 85.3%.[5] Similarly, convulsion and severe headache were mentioned as danger signs in 18% and 39% of the respondents, respectively. This is almost in agreement with the study done in Shashamane town, which is 21.3% and 24.9%, respectively.[22] This might be due to the urbanization of the residents because urban residents have better access to health information and maternal health services as compared with rural residents. Furthermore, in rural areas, sources of information are limited. According to this study, blurred vision 26.5%, fever 25.6%, and water leakage 29.5% are recalled danger signs during pregnancy, respectively. This is higher than the study done at Goba, which was 13.7%, 24.3%, and 18.7%, respectively.[36]

Limitation of the study

The study might not show a cause-and-effect relationship because of the nature of the study design (cross-sectional). Since the study was conducted at the institutional level among mothers who came to health facilities for ANC follow-up, those pregnant mothers who did not come for ANC were notably missed. Therefore, future researchers are recommended to conduct a study on the related topics at the community level to address pregnant mothers with poor care-seeking practices including those who miss their ANC follow-up. Since the data were collected based on self-report, it might be subjected to recall bias and during recruitment of pregnant mothers' selection bias may not be fully ruled out. Despite these potential concerns, as strength, our study able to assess knowledge level of mothers among three health facilities and addressed many variables in the analysis.

Conclusion

The finding of the study revealed that the knowledge level of danger signs of pregnancy overall was poor. The most commonly mentioned danger sign during pregnancy was severe vaginal bleeding followed by headache. The findings from this study revealed that women's knowledge of danger signs during pregnancy was significantly associated with monthly income, walking distance to health facilities, and residence. Regional policymakers are recommended to address intervention modalities focusing on maternal counseling during the ANC follow-up on the commonest symptoms of illness during pregnancy, particularly for rural residents, those who travel a long distance to seek health care and had low-income. Health professionals and health extension workers are also expected to provide strong counseling regarding pregnancy danger signs, which is essential to increase mothers' knowledge in recognition of signs of illness and to improve care-seeking practices without delay. Further comprehensive research at the community level is recommended.

Availability of data and materials

Pertinent data were presented in this manuscript. Additional data can be requested from the corresponding author upon reasonable request.

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.

Ethics approval and consent to participate

Ethical clearance was secured from Haramaya University, College of Health and Medical Sciences, Institutional Health Research Ethics Review Committee (IHRERC) with approval number of IHRERC/214/2020. Written informed consent was obtained from all subjects who were ≥18 years old before the study and written informed consent was obtained from legally authorized representatives for subjects below 18 years old before the study. All methods used in this study were according to the rule and regulations of Haramaya University.

Informed consent

Written informed consent was obtained from all subjects who were ≥18 years old before the study and it was obtained from legally authorized representatives for subjects below 18 years old before the study.

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Supplemental material

Supplemental material for this article is available online.

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