Research Article

Undernutrition and Associated Factors among Pregnant Women in Kacha Birra District, Southern Ethiopia

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Abstract

Background: Worldwide, malnutrition is a public health concern with noteworthy consequence especially in pregnant women. Maternal undernutrition may dispose mothers to poor wellbeing including infection, preeclampsia/eclampsia, and adverse pregnancy outcomes such as preterm birth and intrauterine growth retardation. Pregnant women are exposed to nutritional deficiency because of increased metabolic needs as a result the usually end up in undernutrition. There is lack of updated information in the study area regarding nutritional status and factors among pregnant women.

Objective: To assess undernutrition and associated factors among pregnant womenin Kacha Birra district, Southern Ethiopia in 2019.

Methods: An institution-based cross-sectional study was conducted among 344 pregnant women attending antenatal care in public health facilities from February 21-March 20, 2019. A systematic sampling technique was employed. Data were collected using a structured questionnaire and analyzed by a statistical package for social science version 22 software. Both bivariate and multivariate logistic regression analyses were undergone to identify factors associated with the nutritional status of pregnant women.

Result: Among 344 pregnant women who participated in the study, 52.6% were undernourished. On the multivariable analysis; having a history of peptic ulcer disease [(AOR=1.97 (1.23-3.17)], husband's educational status with Illiterate to elementary [AOR=0.589 (0.369-0.940)], medium dietary diversity score [AOR=2.931 (1.106-7.766)], high dietary diversity score [AOR=2.485 (0.915-6.747)], intestinal parasite infection [AOR=1.725 (1.086-2.742)], second trimester gestational age [AOR=0.338 (0.159-0.718)] had shown statistically significant association with maternal undernutrition.

Conclusion: Over half of pregnant women were in undernurition. Multi-sectorial collaboration and coordination among related sectors and strengthening programs targeted on adult's educational status, improved drinking water and sanitation against pregnant women's, counseling on Antenatal clinic and prevention and treatment of chronic disease during pregnancy.

Keywords: Pregnant Women; Undernutrition; Ethiopia; Antenatal Care

Abbreviations

ANC: Antenatal Care; AOR: Adjusted Odds Ratio; BMI: Body Mass Index; CI: Confidence Interval; CSA: Central Statistical Agency; DDS: Dietary Diversity Score; EDHS: Ethiopian Demographic Health Survey; LBW: Low Birth Weight; MUAC: Mid Upper Arm Circumference; PCA: Principal Component Analysis; PUD: Peptic Inflammatory Disease; SD: Standard Division; SNNPR: Southern Nation Nationalities and Peoples Region; SOP: Standard operational procedure; VIF: Variance Inflation Factor; WHO: World health organization

Background

Worldwide, malnutrition is a health concern of great significance especially in under-five children and pregnant mothers. Malnutrition is considered as a major threat to public health by the WHO [1]. In spite of comprehensive global economic growth, the prevalence of maternal undernutrition was high in Sub-Saharan Africa [2]. Ethiopia is one of the developing countries with a high load of maternal and child undernutrition. However, maternal undernutrition has declined from 30% in 2000 to 22% in 2016 but still too far from achieving the Sustainable Development Goal (SDG) [3].

Pregnancy is a perilous stage of growth and development during which maternal nutrition can powerfully affects neonatal and obstetric outcomes [4]. Best nutrition is essential to uphold the health of the mother, to have a normal and healthy delivery, and also to decrease the risk of suboptimal fetal development, birth defects and prolonged health problems in childhood [5].

Maternal undernutrition may dispose mothers to poor wellbeing including infection, preeclampsia/eclampsia, and adverse pregnancy consequences such as preterm birth and intrauterine growth retardation [6]. Pregnant mothers are mainly vulnerable to nutritional inefficiencies because of increased metabolic needs to be imposed by

pregnancy including developing fetus, maternal tissues and placenta linked with allied dietary risks [7].

Pregnancy rises energy requirements by thirteen perecent, protein by fifty four percent, and vitamin and mineral by zero to fifty perecent. Evidences had proven that 30,000 kcal (336 MJ) is essential to growth and developments of a baby, growth placenta size and reproductive organs, yield energy for newly formed tissues and produce extra fat stores in the women [8,9]. The majority of recent research has revealed that from the beginning, having the right balance of key micronutrients is appropriate to ensure long term health of mothers and their infants [10].

A study in Africa showed that the burden was 23.5% in pregnant mother [11,12]. Different studies in Ethiopia reveal that the prevalence of malnutrition among pregnant women is different from place to place which ranges from 14.4% [13] to 31.8% [14]. Studies in Southern Ethiopia reveal that the prevalence of malnutrition among pregnant women is not consistent according to study done in Sidama zone, it was about 24.6% [15].

Maternal malnutrition is triggered by the complex interaction of a multitude of factors, education status, family income, marital status, severe illness, having recurrent children, household food security, socioeconomic status and greater maternal age were identified factors [16].

Studies recognized that undernourished pregnant mother were at bigger risk of having low birth weight babies [17]. The relationship between low birth weight and deprived health and nutritional status future is also well recognized, which intern causes deprived growth and development, then endup in mortality and morbidity in children [18]. Ethiopian government has developed a revised National Nutrition Prigram (NNP) in 2016 to tackel the burden of malnutrition in lactating and pregnant mother [19].

Although there were evidences in regarding maternal nutritional status but they were not updated and did not assessed an important determinantal variables [20]. The aim of this study was to assess undernutrition and associated factors at the public health facility among pregnant mother living in Kacha Birra district, southern Ethiopia.

Methods

Study area and period

This study was conducted in Kacha Birra district, southern Ethiopia. It is about 327 km away from Addis Ababa the capital city. Located at latitude and longitude of 7˚12′N 37˚46′E with an elevation of 1875 meters above sea level. It has 23-kebeles (2 urban and 21 Rural) with a total population of 127,000 populations, with 64,770 women and 62, 230, men. The district has five health inistitutions, four health centers and one hospital.

The Hospital and all health centers in the district give ANC services. The study was conducted from February - May/2019. Institution-based cross-sectional study was conducted. The source population was all pregnant womens who were attended antenatal care at all health inistitutions of Kacha Birra district and the study population was all randomly selected pregnant women who were attended antenatal care at all health inistitutions during the study

period and fulfilled inclusion criteria. The inclusion criteria were, all pregnant mother who were attended ANC (antenatal care) at all health inistitutions and those who were resident at least for six months in the district and pregnant mother who were seriously ill and those who came for the 2nd and 3rd visit were omitted from the study.

Sample size determination and sampling technique

The sample size was calculated by using single population proportion formula using the prevalence of undernutrition among pregnant women and considering the following variables and assumptions:-

- CI =95%,

- Margin of error =5%

- P= Prevalence of undernutrition in pregnant women in Misso health center 30.3% [21].

- Non-response rate =6%

- Thus, a total sample size was 344.

Sampling technique and procedure

All the five health facilities found in the district were incorporated in the study. The numbers of study subjects were allocated to each health facility according to their number of pregnants attended per year. Thus, statistically, the average number of pregnant mother who was attended ANC in each health inistitutions per year multiplied by the total sample size (n=344), divided by the total number of pregnant mother attended in the entire ANC unit (N=3734). Lastly, the study participants were selected from each health centers using a systematic random sampling technique, the first study participant was selected by lottory method.

Data collection tools and techniques

Data were collected by face to face interviews using an interview administered questionnaire which was prepared in the English language and later translated into Amharic. The questionnaire had four parts socio-demographic, economic, dietary and reproductive parts. The standardized tool for measurement of wealth index was adopted from EDHS (Ethiopia Demographic and Health Survey)-2016.

Dietary diversity by 24-hour dietary recall

Dietary diversity measuring questioner adopted from FANT 2006 will be employed to determine the dietary diversity status of pregnant women. A number of food-groups consumed preceding 24 hours to the survey was assessed. The foods consumed in the preceding 24-hour recall was grouped in 9 food-groups which are listed:- 1. Grains, roots or tubers 2. Vitamin A-rich plant foods 3. other fruits or vegetable 4. Eggs, 5. Meat, poultry, 6. Fish, seafood 7. Pulses/legumes/nuts 8. Milk and milk products 9.Foods cooked in oil/fat. Dietary diversity scores was made by summing up the number of food groups consumed over the previous 24 hours period by an individual and classified accordingly.

Anthropometric measurements

Maternal anthropometric measurements were done according to the standards. MUAC of a pregnant mother was measured at mid-

point between the tip of the shoulder and the tip of the elbow of the left arm. An adult Mid-Upper Arm Circumference (MUAC) tape that was non-elastic and non-stretchable was used to take measurements, after checking that the tape was applied with correct tension. The Mid-Upper Arm Circumference (MUAC) of a pregnant mother was read and documented to the nearest 0.1cm. MUAC measurement was performed by clinical nurse/public health professionals following standard instructions and steps. A range below 23 cm was an indicator of undernutrition and a range of >23 cm was for normal nutritional status

Data collectors

Data collection process was done by five qualified diploma nurses and 2 BSc health officers who are speaking the local language was participate as a data collector and supervisor respectively. One day training was given to the data collectors on the objectives and purpose of the study briefly. Simulated interviews, and real field activity was given to data collectors and supervisors to guarantee the quality of the field job.

Data Processing and analysis procedures

The data were entered with Epi-Data version 3.1 and were cleaned and analyzed by Statistical Package for the Social Sciences (SPSS) for window version 22. Descriptive statistics, mean, frequency and standard deviation were implemented. Inferential statistical tests like bivariate and multivariable logistic regression analyses were implemented. Multivariable logistic regression with backward method was used to identify associated factors of undernutrition. Before running multivariable logistic regression, multi-collinearity between independent variables was checked by Variance Inflation Factors (VIF) and no variable with VIF of > 10 was observed. Variables that had p-value of less than 0.25 in the bivariate logistic regression models were a candidate for multivariable logistic regression. The model fitness for the variables was assessed by the Hosmer-Lemeshow goodness of fit test and produced p-value of 0. 983. Those variables with p-value < 0.05 was considered as statistically significantly associated factors in the multivariable analysis. Wealth index was determined using the PCA analyses and all assumptions were checked and fulfilled [25]. Facor score were used to classify final wealth index and ranked into tertiles as "poor", "medium" and "rich".

Data quality control

A structured questionnaire was translated to Amharic and back to English for consistency, two days interactive training was given for data collectors and all standardization techniques were done. The overall data collection procedure was organized by the PI (principal investigator). The pre-test was conducted at five percent of the whole sample size in Hadaro health center, a near by health center outside the study area just one week before the data collection time. The appropriate working of instruments, laboratory reagents, and technical performance was tested by using quality control samples. SOPs and manufacturers' instructions were strictly followed beginning from sample collection up to reporting. All the laboratory processes were controlled by medical laboratory professionals.

Ethics consideration

Ethical clearance was obtained from the ethical review committee of Jimma University. Official permission was secured from the Kacha

Birra district health office. Verbal and written consent was obtained from all participants after a clear orientation of the study objective. Privacy, anonymity, and confidentiality will be ensured throughout the process of the study. Finally, those detected as undernutrition are linked to the health facility to take treatment accordingly and advice was given for them. This study was conducted in accordance with the Declaration of Helsinki

Results

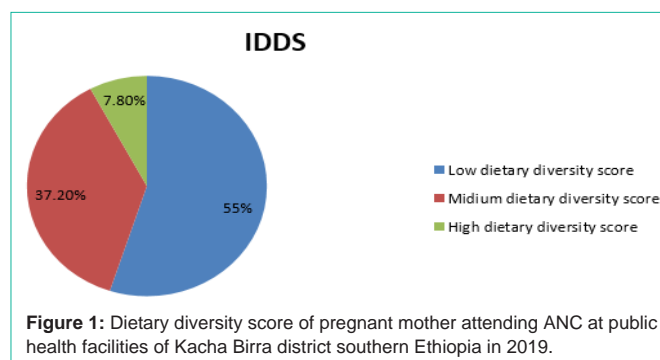### Demographic and socioeconomic and obstetrics characteristics

A total of three hundred forty-four women were participated in this study with a response rate of 100%. The age of the participants ranged from 15-38 years. Morethan half 180(52.2%) participants were found in the age range of 25-29. Pertaining to maternal educational status, 66.6% were at the primary educational level. Regarding the educational status of the husband, 57.8% have completed the primary educational level. Concerning the occupational status of the participant, 63.1% were housewives. And the majority (94.7%) of the participants were married. more than half (63.1%) of the participants household size was 5-7 persons. Regarding residency, more than two-third (73.3%) of respondents are living in rural areas. Regarding the birth interval, 72.4% have less than two years pregnancies interval. Concerning the gestational age of the pregnancy, more than half (52.9%) of the participants were in the third trimester. Finally, regarding history of abortion, most of the respondents(81.7%) had no history of abortion (Table 1).

Dietary and illness-related characteristics

Regarding maternal dietary diversity scores, more than half (55%) of pregnant mothers were under low dietary diversity scores (Figure 1).

The majority of the respondents (93%) have experienced consumption of tea or coffee immediately after a meal. Most of the respondents had injera with wot 71.5%. Regarding the history of peptic ulcer disease, about 44.8% of respondents had developed PUD. Regarding the HIV status of the pregnant women around 14.5% were reactive for HIV. Concerning the intestinal parasite infection, more than half 57.3% of the respondents had developed intestinal parasite infection (Table 2).

Out of the total three hundred forty four pregnant mother attending the ANC in the public health facility of kacha birra district there were more than half (52.6%) pregnant women were malnourished (Figure 2).

Figure 1: Dietary diversity score of pregnant mother attending ANC at public health facilities of Kacha Birra district southern Ethiopia in 2019.

Table 1: Socio-demographic and obstetrics characteristics of the study among the pregnant mother attending ANC at public health facilities of kacha birra district southern Ethiopia in 2019 (n=344).
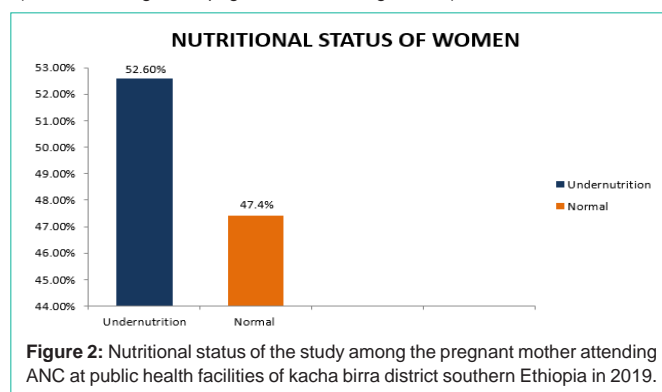
VARIABLES	MUAC measurement		P-value
	>23 cm	<=23 cm	
Residence of mother			0.118
Urban	50(54.3%)	42(45.7%)	
Rural	113(44.8%)	139(55.2%)	
Family size	19(35.2%)	35(64.8%)	0.006
1-4	117(53.9%)	100(46.1%)	
5-7	27(37.0%)	46(63.0%)	
>=8			
Age of mother			0.381
15-19	5(62.5%)	3(37.5%)	
20-24	35(47.9%)	38(52.1%)	
25-29	88(48.9%)	92(51.1%)	
30-34	25(37.9%)	41(62.1%)	
>35	10(58.8%)	7(41.2%)	
Marital Status			0.013
Married	149(45.7%)	177(54.6%)	
Single	12(85.7%)	2(14.3%)	
Other	2(50%)	2(50%)	
Mother educational status		111(48.5%)	0.03
Illiterate to elementary	118(51.5%)	70(60.9%)	
Above elementary	45(39.1%)		
Husband educational status of	82(56.6%)	63(43.4%)	0.004
Illiterate to elementary	81(40.7%)	118(59.3%)	
Above elementary			
Gestational age	33(73.3%)	12(26.7%)	0.001
1st trimester	51(43.6%)	66(56.4%)	
2nd trimester	79(43.4%)	103(56.6%)	
3rd trimester			
Pregnancy interval b/n previous and current	91(45.0%)	111(55.0%)	0.798
<=2 yrs.	36(46.8%)	41(53.2%)	
>2yrs			
History of abortion			0.102
Yes	24(38.1%)	39(61.9%)	
No	139(49.5%)	142(50.5%)	
Household wealth tertials			0.945
Poor	66(48.2%)	71(51.8%)	
Medium	32(45.7%)	38(54.3%)	
Rich	65(47.4%)	72(52.6%)	

Table 2: Dietary and illness-related characteristics of the study among the pregnant mother attending ANC at public health facilities of Kacha Birra district southern Ethiopia in 2019 (n=344).

VARIABLES	MUAC measurement		P-value
	>23 cm	<=23 cm	
Intestinal Parasite			0.011
No	58(39.5%)	89(60.5%)	
Yes	105(53.3%)	92(46.7%)	
Staple food			0.193
Other*	41(41.8%)	57(58.2%)	
Teffe injera with wot	122(49.6%)	124(50.4%)	
Malaria test result			0.282
Positive	26(41.3%)	37(58.7%)	
Negative	137(48.8%)	144(51.2%)	
Dietary diversity score			0.086
Low	90(47.6%)	99(52.4%)	
Medium	57(44.5%)	71(55.5%)	
High	16(69.6%)	7(30.4%)	
History of chronic illness			0.148
Yes	30(40.0%)	45(60.0%)	
No	133(49.4%)	136(50.6%)	
History of peptic ulcer disease	58(37.7%)	96(62.3%)	0.001
Yes	105(55.3%)	85(44.7%)	
No			
HIV status of mother	24(48.0%)	26(52.0%)	0.925
Reactive	139(47.3%)	155(52.7%)	
Non reactive			
Tea or coffee after meal			0.153
Yes	155(48.4%)	165(51.6%)	
No	8(33.3%)	16(66.7%)	

*(maize and sorghum, spaghetti and rice, vegetables')

Figure 2: Nutritional status of the study among the pregnant mother attending ANC at public health facilities of kacha birra district southern Ethiopia in 2019.

In bivariate analysis a total of 11 variables (Residence, family size, educational status of mother, educational status of father, intestinal parasite, DDS, Gestational age, histry of chronic illness, histry of peptic ulcer disease, tea or coffee drinking and history of abortion were scred p-value < 0.25 and became candidate for multivariabe analysis.

Finally 6 variables (tea or coffee after the meal, gestational age, history of peptic ulcer disease, dietary diversity score, intestinal parasite, husband educational status) were secred p-value < 0.05 and declared as statistically significantly associated factors with undernutrition independently.

Multivariable logistic regression analysis indicated that, those

Table 3: Multivariate logistic regression analysis among pregnant women at ANC clinic in Kacha Birra district southern Ethiopia in 2019 (n=344).

Variables	MUAC		COR	AOR	95% C.I.		P
	>23 cm	<=23 cm			Lower	Upper	
Mother educational status					0.384	1.169	
Illiterate to elementary	118(51.5%)	111(48.5%)	0.605	0.67			0.159
Above elementary	45(39.1%)	70(60.9%)	1	1			
Husband Educational status							
Illiterate to elementary							
Above elementary	82(56.6%)	63(43.4%)	0.527	0.589	0.369	0.94	0.026
	81(40.7%)	118(59.3%)	1	1			
Intestinal Parasite							
No	58(39.5%)	89(60.5%)	1	1	1.086	2.742	0.021
Yes	105(53.3%)	92(46.7%)	0.571	1.725			
Dietary diversity score							
Low	90(47.6%)	99(52.4%)	2.5142.847	2.931	1.106	7.766	0.031
Medium	57(44.5%)	71(55.5%)	1	2.485	0.915	6.747	0.074
High	16(69.6%)	7(30.4%)		1			
History of peptic ulcer disease							
Yes	58(37.7%)	96(62.3%)	2.045	1.975	1.23	3.17	0.005
No	105(55.3%)	85(44.7%)	1	1			
Gestational age							
1st trimester	33(73.3%)	12(26.7%)	1	1			
2nd trimster	51(43.6%)	66(56.4%)	0.279	0.338	0.159	0.718	0.005
3rd trimster	79(43.4%)	103(56.6%)	0.993	0.928	0.594	1.608	0.928
Tea or coffee after meal							
Yes	155(48.4%)	165(51.6%)	0.532	0.398	0.153	1.034	0.059
No	8(33.3%)	16(66.7%)	1	1			

mothers of hasband with illiterate to elementary education were 41.1% [AOR= 0.589, 95% CI: 0.369-0.940] less likely of becoming undernourished than those educational status of above elementary. The odds of becoming undernourished among pregnant women with parasitic infection on current pregnancy were 1.725 times more likely than those who did not have parasitic infection [AOR=1.725, 95% CI: 1.086 - 2.742].

In the current study mothers gestational age had shown an association with nutritional status. The risk of undernutrition on mother's second trimester had 66.2% less likely than the First trimester.

Pregnant women who had history of peptic ulcer disease were 1.975 times more likely to develop undernutrition than those who did not had history of peptic ulcer disease [AOR=1.975, 95% CI: 1.230-3.170]. Study participants with low dietary diversity score were 2.931 times more likely to became undernourished as compared to those pregnant women's who have high dietary diversity score [AOR=2.931, 95% CI: 1.106-7.766] (Table 3).

Discussion

The overall prevalence of undernutrition in Kacha Birra District was 52.6%. This finding was higher than the study conducted in

Diredawa, which was reported as 18.2% [26]. The discrepancy might be due to varation in study setting and socio economic characterstics.

Compared to the current result, a lesser prevalence of undernutrition was revealed in Wondo Genet 9.2% [27] which used a different cut off value with the current study; they used a Mid-Upper Arm Circumference <21cm while we were used a Mid-Upper Arm Circumference <23cm. Likewise, studies from Hossana [15], Alamatsa [28] and Gonder [13] reported that a relatively lesser prevalence than the current study and this is might be due to the difference in socio-demographic and economic characteristics, dietary habit and difference in cutoff point of MUAC. In contrary, a study done in Aleta Chuko Southern Ethiopia revealed that the prevalence was 71.15% [29]. This might be due to difference in study period and study setting.

Those mothers whose husband's educational status from Illiterate to elementary schooled were 41% less likely to develop undernutrition compared to those mothers whose husband's educational status was above elementary schooled. It is obvious that when the more the husbands educationl status is the better the maternal nutritional status would be. This finding is lower than a study done in Alamata, Northern Ethiopia. The difference is might be due to the variation in sample size and demographic condition of the study areas [28].

In the current study mothers with intestinal parasite infection had shown an association with nutritional status. The odds of malnutrition among mothers who had intestinal parasite was 1.73 times higher than those without the intestinal parasite. It is evidenced that intestinal parasite is an infection so that the appetite would be decreased due to body response and there would be nutrient competition and a catabolic state.

In the current study mothers with low dietary diversity scores had shown an association with nutritional status. The odds of undernutrition on mothers who had low dietary diversity scores had 2.93 times higher than those with high dietary diversity score respectively. These is lower than a study done in Hosana Nigist Eleni hospital Southern Ethiopia, the difference is might be due to smaller in sample size and the inclusion of only one health facility in the case of study in Hosanna [15].

In the current study, mothers with a history of peptic ulcer disease had shown an association with nutritional status. The odds of undernutrition on mothers who had a history of peptic ulcer disease had 1.97 times higher than those without a history of peptic ulcer disease. It is clinically supported that any peptic ulcer had a negative effect on nutritional status because of decreased appetite and nausea and vomiting related to the PUD.

In the current study mothers, gestational age had shown an association with nutritional status. The risk of undernutrition on mother's second trimester had 66.2% less likely than the first trimester. It is fact that when the the gestational age increases similarly the gestational will increase this but in contrast there nutritional status decrease this is might be reduced food intake and decreased appetite [30].

Conclusion

There was a high prevalence of undernutrition among study participants in the current study studies. Educational status of husband, presense of intestinal parasite, low DDS, histry of peptic ulcer disease and gestatinal age of second trimester was associated with undernutrition among the pregnant mother attending ANC.

Therefore, intervention strategies addressing dietary modification, dietary diverisity, lifestyle modification and behavioral change communication factors should be enhanced especially for pregenant womens. Dual counseling service for the pregnant women's and her family during the ANC service might be also help to improve the maternal nutritional status.

Acknowledgement

Funding

Availability of Data and Materials

The dataset used for this study cannot be shared and in the future interested parties may request the approval to access the data by writing to Jimma University Institutional Review Board.

Authors' Contributions

Melese Sinaga Teshome and Desalech H/Meskel conceived the research idea, conducted the data collection, data analysis, and data interpretation, wrote and reviewed the paper. Melese Sinaga Teshome, Desalech H/Meskel, Kidus Temesgen Worsa, Abrachew Datiko and Tabarak Malik reviewed and approved the final paper. MST reviewed the paper. Melese sinaga teshome; the Corresponding author had the responsibility to submit the manuscript for publication. All authors contributed toward data analysis, drafting and revising the paper and agree to be accountable for all aspects of the work.

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