


Magnitude and Associated Factors of Thrombocytopenia among Pregnant Women Attending Antenatal Care Clinics at Dessie Comprehensive Specialized Hospital, Northeast Ethiopia

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Abstract

Background: Thrombocytopenia is a common hematological abnormality during gestation. Pregnant women with severe thrombocytopenia may be associated with a higher risk of excessive bleeding during or after delivery. Therefore, the main aim of this study was to assess the magnitude and associated factors of thrombocytopenia among pregnant women attending antenatal care services at Dessie comprehensive and specialized hospital, Northeast Ethiopia.

Methods: An institution-based cross-sectional study was conducted from February to March 2021. Using a systematic random sampling technique, a total of 294 pregnant women were enrolled in the study. Structured interviewer-administered questionnaires were used to collect socio-demographic and clinical data of study participants. Four ml of venous blood were collected from each pregnant woman and a complete blood count was determined using DIRUI BF 6500 automated hematology analyzer. Data were entered into Epidata version 4.6.0 and then exported into SPSS version 24.0. Multivariate logistic regression was used to assess the association between dependent and independent variables. P-value < 0.05 was considered to be statistically significant.

Results: A total of 294 pregnant women who visited antenatal care services at Dessie comprehensive specialized hospital were included. The mean (\pm SD) age of the study participants was 29.7 (\pm 6.1) years. The prevalence of thrombocytopenia among pregnant women was 9.9% (95% CI: 6.5, 13.6). A mild type of thrombocytopenia is the major type and accounted for 72.4% whereas moderate thrombocytopenia and severe thrombocytopenia accounted for 17.2% and 10.4% respectively among pregnant women. Multivariate logistic regression showed that urban residents (AOR: 0.206, 95% CI, 0.055-0.748), gestational ages within the first trimester (AOR: 0.183, 95% CI, 0.057-0.593) and gestational ages within the second trimester (AOR = 0.264, 95% CI, 0.092-0.752) were significantly associated and independent predictors of thrombocytopenia in pregnant women.

Conclusion: In this study, the prevalence of thrombocytopenia was 9.9% and the mild type of thrombocytopenia (72.4%) was higher than the other type of thrombocytopenia among pregnant women. In multivariate logistic regression analysis, residence and gestational age (trimester) were significantly associated with thrombocytopenia. Therefore, the platelet count should be routinely determined during the antenatal care visit for proper diagnosis and to minimize bleeding during and or after childbirth.

Keywords

thrombocytopenia, pregnant women, pregnancy, platelet count, Ethiopia

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Introduction

Platelets (thrombocytes) are small non-nucleated cells that circulate in the blood playing a significant role in maintaining vascular integrity and regulating hemostasis.^{1,2} Platelets are derived by the cytoplasmic fragmentation of megakaryocytes, hematopoietic cells residing in the bone marrow.^{3,4} Platelets have participated in primary hemostasis as they express membrane receptors that can bind with subendothelial collagen via von Willebrand factors.⁵ The binding of platelets with subendothelial collagen stimulates aggregation, activation, and release of different factors from the platelet granules which facilitates the formation of a temporary platelet plug at the sites of vascular damage.^{6,7} Moreover, it provides a phospholipid membrane known as platelet factor three acting as a catalytic surface initiating secondary hemostasis via the coagulation pathway.^{8,9}

Thrombocytopenia can be defined as if the platelet count is less than $150 \times 10^9/L$ of blood.¹⁰ It is the most common hematological abnormality in pregnancy following anemia.¹¹ It can be classified as mild thrombocytopenia if the platelet count is between $100 \times 10^9/L$ to $150 \times 10^9/L$, moderate if the platelet count is between $50 \times 10^9/L$ to $100 \times 10^9/L$, and severe if the platelet count is less than $50 \times 10^9/L$ of blood.¹²⁻¹⁴ During pregnancy, there is a general downward drop in platelet count specifically during the last trimester. The underlying mechanisms for the downward drift of platelet count might be through a combination of dilution effects, increased platelet consumption across the placenta, and mild immune process. Hence, pregnant women in the third trimester may have a lower mean platelet count than non-pregnant women.^{15,16}

The pathophysiological process for thrombocytopenia is not known but various factors could be suggested to associate with the occurrence of thrombocytopenia in pregnant women.^{16,17} The most common are gestational thrombocytopenia (GE), pre-eclampsia/eclampsia (PE), hemolysis, elevated liver enzymes, low platelets (HELLP) syndrome, and idiopathic immune thrombocytopenia (ITP).^{10,17} Some causes of thrombocytopenia may be associated with mild medical disorders and may not be associated with serious fetal and maternal clinical outcomes.^{18,19} Gestational thrombocytopenia is benign and responsible for more than 75% of thrombocytopenia in pregnant women.^{20,21} The pathophysiological causes of gestational thrombocytopenia are unclear. It might be speculated that secondary to accelerated platelet consumption, decreased platelet production, and increased plasma volume might be the probable cause of gestational thrombocytopenia. It is usually mild and may not be associated with serious maternal and fetal complications which may cause bleeding into mucus membranes presenting as petechiae, ecchymoses, epistaxis, and gingival bleeding.^{16,22,23}

On the other hand, some causes of thrombocytopenia may be associated with serious medical conditions that might be related to severe maternal and fetal morbidity and mortality. Thrombotic thrombocytopenic purpura (TTP), hemolytic uremic

syndrome (HUS), and disseminated intravascular coagulopathy (DIC) are rare causes of thrombocytopenia which might be associated with severe clinical complications.^{24,25} In the other cases, thrombocytopenia can be associated with complex clinical disorders that include PE, HELEP syndrome, and ITP. It might be associated with profound life-threatening maternal and fetal clinical outcomes.^{15,25} The other causes of thrombocytopenia can be infectious diseases like malaria, HIV/AIDS, nutritional deficiency such as folic acid, vitamin B₁₂ deficiency, and other disease conditions like leukemia and aplastic anemia.²⁶⁻²⁹

Thrombocytopenia affects 6% to 10% of pregnant women worldwide and it is the most common hematological disorder in pregnant women during the gestation period. It affects around one-tenth of pregnant women in the world.^{3,30} Pregnant women with severe thrombocytopenia could have a higher risk of excessive bleeding during or after childbirth which may be associated with an increased risk of maternal and fetal complications.¹³ Although various studies have been conducted in developed countries to assess the prevalence and associated factors of thrombocytopenia in pregnant women, few studies were done in developing countries including Ethiopia, particularly in our study area. Therefore, this study aimed to determine the magnitude of thrombocytopenia and its predictors among pregnant women attending antenatal care services at Dessie comprehensive specialized hospital.

Methods and Materials

Study Design, Period, and Area

An institutional-based cross-sectional study was conducted from February to March 2021 in the ANC services of Dessie comprehensive specialized hospital. The hospital provides teaching and training services for medical students, residents, and other health science students. In addition, it provides clinical services for inpatient and outpatients including emergency, antiretroviral therapy services, chronic care, surgical, dental, medical, pediatric, gynecologic, obstetric, and other services for more than 4 million clients.

Study Populations and Participants

The study population comprises all pregnant women attending ANC services of Dessie comprehensive specialized hospital during the study period. The study participant who was critically ill to be interviewed or to respond was excluded. Pregnant women taking anticoagulant and antiplatelet agents and who had a history of known inherited bleeding disorders, hypertension, chronic renal disease, chronic liver disease, infectious diseases (human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV)) were excluded from the study.

Sample Size Determination and Sampling Technique

The sample size was determined by using single population proportion formula by considering 95% of confidence interval (CI),

and 4% margin of error (d) to maximize the sample size, and by taking 13.5% prevalence of thrombocytopenia among pregnant women attending ANC in Ethiopia.³¹ Therefore, after considering the 10% non-respondent rate, the final sample size for this study was 294 pregnant women. A systematic random sampling technique was employed to select study participants who fulfilled the eligibility criteria.

Data Collection and Laboratory Analysis

A structured and interviewer-administered questionnaire was used to collect data on demographic variables and client data extraction sheet to collect gynecological related variables. Four ml of venous blood was collected from each pregnant woman using an EDTA test tube under the aseptic condition to perform a complete blood count (CBC) analysis. Platelet count was determined using DIRUI BF 6500 automated hematology analyzer (DIRUI INDUSTRIAL CO. LD, P.R., CHINA) by a medical laboratory technologist.

Data Quality Management

To maintain the quality of the data, the questionnaire was pre-tested before the actual data collection. Standard operating procedures (SOPs) were strictly followed during the collection and processing of blood specimens. Blood Samples were properly mixed and homogenized by inverting 8-10 times and safety and specimen handling procedures were strictly followed. The performance of the automated hematology analyzer was maintained through daily background checking. Daily cleaning of automated hematology analyzers and other equipment before leaving the laboratory was conducted.

Data Management and Analysis

Data were coded, entered, and cleaned using Epi data 4.6.0 version and then exported to statistical package for social

Table 1. Socio-Demographic Characteristics of Study Participants at Dessie Comprehensive Specialized Hospital, Northeast Ethiopia.

Variables	Category	N	%
Age (years)	15-24	84	28.6
	25-34	142	48.3
	≥34	68	23.1
Residence	Urban	276	93.9
	Rural	18	6.1
Educational status	Not read and write	88	29.9
	Primary school	84	28.6
	Secondary school	64	21.8
	Diploma and above	58	19.7
Occupational status	Non-employed worker	121	41.2
	Employed worker	173	58.8
Marital status	Single	16	5.4
	Married	239	81.3
	Divorced	27	9.2
	Widowed	12	4.1

sciences (SPSS) version 24.0 (IBM Corporation, Armonk, NY, USA). Descriptive statistics were used to present the frequency and percentage of the demographic and clinical variables. Multivariate logistic regression was used to determine the association between dependent and independent variables. P-value <0.05 was considered to be statistically significant.

Results

Socio-Demographic Characteristics of Study Participants

In this study, a total of 294 women on ANC follow-up at Dessie comprehensive and specialized hospital were included. The mean (\pm SD) age of the study participants was 29.7 (\pm 6.1) years. Regarding the age classification of the study participant, 84 (28.6%) were under the age range of 15-24 years, 142 (48.3%) were under the age range of 25-34 years, and 68 (23.1%) participants were >35 years. Moreover, about 93.6% of study participants live in urban areas (Table 1).

Gyneco-Obstetrics Related Characteristics of Study Participants

Out of the total study participants, 118 (40.1%) were in the first trimester, whereas, 102 (34.7%) and 74 (25.2%) were in the second and third trimester consecutively. About 57.1% of pregnant women did not take iron and folic acid supplementation. Regarding the number of children, 87 (29.6%) of respondents

Table 2. Gyneco- Obstetrics Related Characteristics of Study Participants at Dessie Comprehensive Specialized Hospital, Northeast Ethiopia.

Variables	Categories	N	%
Number of children	No child	94	32.0
	One	87	29.6
	Two	56	19.0
	Three	33	11.2
	Four and above	24	8.2
Birth interval	One	30	15.0
	Two	68	34.0
	Three	84	42.0
	Four and above	18	9.0
Taking iron and folic acid supplementation	Yes	126	42.9
	No	168	57.1
History of blood loss	Yes	24	8.2
	No	270	91.8
Abortion history	Yes	38	12.9
	No	256	87.1
Frequency of abortion	Once at a time	32	84.2
	Twice at a time	06	15
Gestational ages	First trimester	118	40.1
	Second trimester	102	34.7
	Third trimester	74	25.2

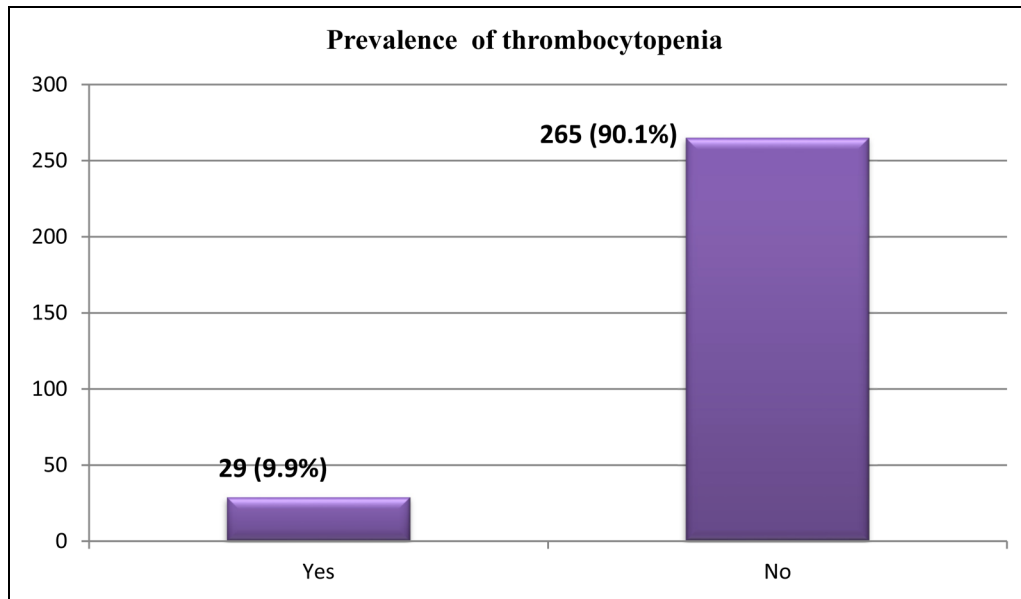


Figure 1. Magnitude of thrombocytopenia among study participants at Dessie comprehensive specialized hospital, Northeast Ethiopia.

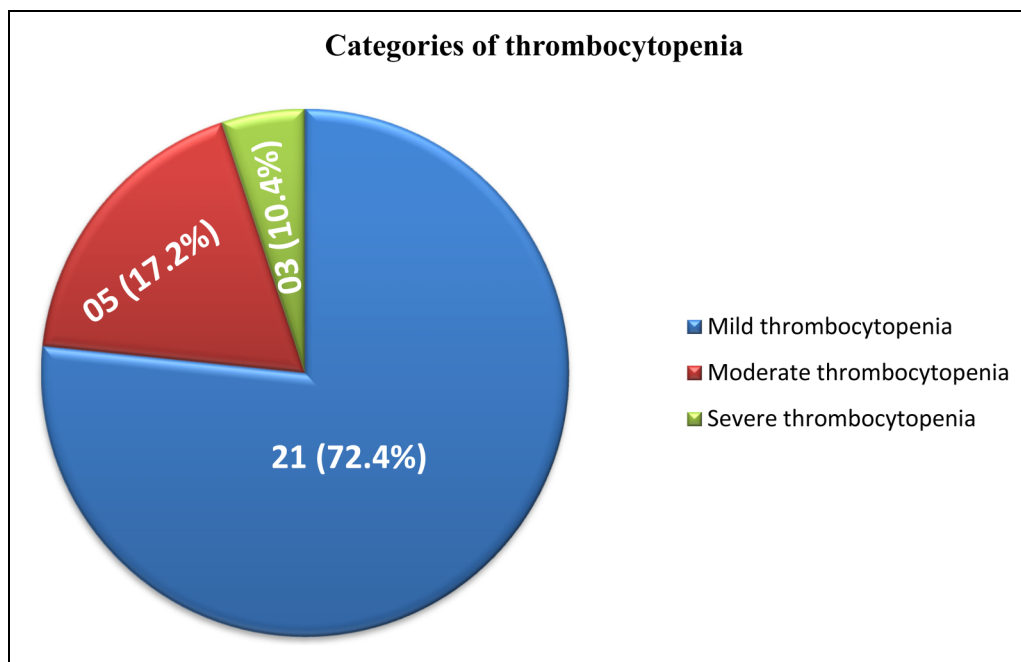


Figure 2. Categories of thrombocytopenia among study participants at Dessie comprehensive specialized hospital, Northeast Ethiopia.

had only one child, and 94 (32.0%) had no children. About abortion history, 256 (87.1%) of women had no history of abortion (Table 2).

Magnitude of Thrombocytopenia among Study Participants

In this study, the overall prevalence of thrombocytopenia was 29 (9.9%) in pregnant women with a mean platelet count of $257.79 \times 10^9/L (\pm 75.06)$ of blood (Figure 1).

Categories of Thrombocytopenia among Study Participants

In our study, about 72.4% of pregnant women had mild thrombocytopenia, about 17.2% had moderate thrombocytopenia and 10.4% had severe thrombocytopenia (Figure 2).

Associated Factors with Thrombocytopenia among Study Participants

In this study, multivariate logistic regression was used to assess the association of socio-demographic and gynecological

Table 3. Associated Factors with Thrombocytopenia Among Pregnant Women at Dessie Comprehensive Specialized Hospital, Northeast Ethiopia.

Variables	Categories	Thrombocytopenia		AOR	95% CI	P-value
		Yes n (%)	No n (%)			
Age (years)	15-24	05 (7.4)	63 (92.6)	7.856	0.424-145.736	0.167
	25-34	14 (9.9)	128 (90.1)	2.138	0.551-8.291	0.272
	>34	10 (11.9)	74 (88.1)	1		
Residence	Urban	24 (8.7)	252 (91.3)	0.206	0.055-0.748	0.019*
	Rural	03 (16.7)	15 (83.3)	1		
Educational status	Illiterate	21 (10.2)	185 (89.8)	1.135	0.483-2.670	0.608
	Literate	08 (9.1)	80 (90.9)	1		
Occupational status	Non-employed worker	11 (9.1)	110 (90.9)	1.161	0.528-2.556	0.843
	Employed worker	18 (10.4)	155 (89.6)	1		
Marital status	Single	3 (18.75)	13 (81.25)	0.834	0.089-7.850	0.874
	Married	19 (9.9)	220 (90.1)	0.216	0.035-1.345	0.100
	Divorced	5 (18.5)	22 (81.5)	1.281	0.172-9.556	0.809
	Widowed	2 (16.7)	10 (83.3)	1		
Number of children	No child	9 (9.6)	85 (90.4)	0.612	0.110-3.410	0.576
	One child	7 (8.0)	80 (92.0)	0.648	0.119-3.528	0.616
	Two child	6 (10.3)	50 (89.3)	0.708	0.120-4.193	0.704
	Three and above	7 (12.9)	50 (87.1)	1		
Taking iron and folic acid supplementation	Yes	13 (10.3)	113 (89.7)	1.093	0.505-2.363	0.845
	No	16 (9.5)	152 (90.5)	1		
History of blood loss	Yes	04 (16.7)	20 (83.3)	1.960	0.621-6.188	0.275
	No	25 (9.3)	245 (90.7)	1		
Abortion history	Yes	05 (13.2)	33 (86.8)	1.465	0.523-4.103	0.664
	No	24 (9.4)	232 (90.6)	1		
Gestational ages	First trimester	06 (5.1)	112 (94.9)	0.183	0.057-0.593	0.001*
	Second trimester	07 (6.9)	95 (93.1)	0.264	0.092-0.752	0.009*
	Third trimester	16 (21.6)	58 (78.4)	1		

Abbreviations: AOR: adjusted odds ratio; CI: confidence interval.

Note: *: statistical significant at p-value <0.05.

variables with thrombocytopenia in pregnant women. Multivariate logistic regression analysis showed that urban residents (AOR: 0.206, 95% CI, 0.055-0.748, $P=0.019$), gestational ages within first trimester (AOR: 0.183, 95% CI, 0.057-0.593, $P=0.001$) and gestational ages within second trimester (AOR = 0.264, 95% CI, 0.092-0.752, $P=0.009$) were significantly associated and independent predictors of thrombocytopenia in pregnant women ($P<0.05$) (Table 3).

Discussion

Thrombocytopenia is a common hematological problem during pregnancy often underdiagnosed and mismanaged. In this study, the overall prevalence of thrombocytopenia was 9.9% (95% CI: 6.5, 13.6) in pregnant women. The current finding was similar with different studies done in India (8.8%),¹¹ Iraq (8.0%),³² Baghdad (7.1%),³³ Nigeria (13.5%),²⁰ and Libya (8.3%)³⁴ and other studies conducted in a different area of Ethiopia including Gondar, (8.8%),³⁵ Debre Berhan, (10.2%),³⁶ and Addis Ababa, (11.62%).³⁷ However, this finding was higher than the study done in South Africa (5.3%)³⁸ and lower than the studies conducted in China (28.2%),²² Libya (18.0%),³⁹ and Ghana (15.3%).⁴⁰ The

possible reason for the difference might be due to the differences in socioeconomic status, geographical variation, study population, availability and accessibility of health care facilities, health-seeking behaviors, a diagnostic method used, and differences in dietary habits of the study populations. In pregnancy, most cases of thrombocytopenia are due to increased platelet destruction, which can be caused by immunologic destruction, abnormal platelet activation, or platelet consumption that is a result of excessive bleeding or exposure to abnormal vessels whereas less common cases are due to decreased platelet production which can be associated with bone marrow disorders and nutritional deficiencies.⁴¹

In our study, a mild type of thrombocytopenia was the predominant type which accounted for 72.4% of cases followed by moderate thrombocytopenia which accounted for 17.2% cases, and severe thrombocytopenia accounted for 10.4% cases in pregnant women. This finding was in line with studies conducted in Ghana,⁴⁰ Nigeria,²⁰ Libya,³⁴ and Ethiopia.³⁵ However, the current finding was inconsistent in the study done in India in which 51% had mild thrombocytopenia, 33.3% had moderate thrombocytopenia and 9.4% of pregnant women had severe thrombocytopenia⁴² and another finding in India showed that 70.9% had moderate

thrombocytopenia and 29.1% had severe thrombocytopenia.⁴³ The possible justifications for the differences in the findings might be due to the variation in sample size, study design, diagnostic methods used, and difference in socio-economic status and study populations. A mild type of thrombocytopenia is not associated with serious adverse maternal and fetal clinical outcomes. On the other hand, pregnant women with severe thrombocytopenia are at a high risk to develop the bleeding disorder during and after delivery due to the normalization of coagulant activity near to the term and following delivery that can be associated with profound maternal and fetal morbidity and mortality.^{22,44}

Moreover, multivariate logistic regression analysis showed that residence and gestational ages (trimesters) had a statistically significant association with thrombocytopenia. Gestational ages within first trimester (AOR: 0.183, 95% CI, 0.057-0.593, $P = 0.001$) and gestational ages within second trimester (AOR = 0.264, 95% CI, 0.092-0.752, $P = 0.009$). This finding was in agreement with the findings reported in India¹¹ and Libya³⁴ showed that platelet counts in the first and second trimesters were significantly higher than their corresponding values in the third trimester. The possible explanation for this might be that as gestation progresses, there might be a higher physiological decrease in platelet count due to increased hemodilution, increased platelet consumption, increased platelet activation within the placental circulation, and increased aggregation.^{15,25,45} In this study, the residence was significantly associated with thrombocytopenia where urban residents (AOR: 0.206, 95% CI, 0.055-0.748, $P = 0.019$). This was in concordance finding reported in Ethiopia.³⁵ The findings of our study should be concluded in light of some limitations; the study was cross-sectional therefore, we could not establish a cause-effect relationship between thrombocytopenia and the independent factors. Additionally, screenings for parasitic infections were not conducted. A large-scale longitudinal or follow-up study should be conducted by including other clinical variables to investigate their cause-effect relationship with thrombocytopenia in pregnant women.

Conclusion

The prevalence of thrombocytopenia was 9.9% and mild type of thrombocytopenia was dominant and accounted for 72.4% of the cases. Residence and gestational ages (trimesters) had a statistically significant association with thrombocytopenia. Pregnant women should be screened for thrombocytopenia. Platelet count should be done as a routine laboratory test during antenatal care visits for timely diagnosis and to achieve the favorable fetomaternal outcome during gestation and delivery. Proper emphasis should be given during child delivery of women with severe thrombocytopenia to prevent bleeding complications.

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Author's Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Data Availability

The authors confirmed that all the data for this manuscript are available; if someone wants to request the data they can contact the corresponding author.

Declaration of Conflicting of Interest

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

Ethical Approval

The study was approved by the Institutional Review Board of College of Medicine, and Health Sciences at Wollo University, Dessie, Ethiopia. This study was performed according to the principles laid out in the Declaration of Helsinki

Informed Consent

All authors consent for publication.

Availability of Data and Materials

Furnished upon request.


Declaration of Conflicting Interests

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