International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Stephen LC et al. Int J Reprod Contracept Obstet Gynecol. 2023 Jan;12(1):206-214
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20223495

Original Research Article

Incidence and determinants of low birth weight in a tertiary hospital at South Andaman: a prospective study

Lena Charlette Stephen[1], Shreya Barik[2], Abhishek Malakar[2]*

[1]Department of Community and Family Medicine, AIIMS Madurai, Madurai, Tamil Nadu, India
[2]Department of Obstetrics and Gynaecology, Dr. B.C. Roy Multispeciality Medical Research Centre, IIT Kharagpur, Kharagpur, West Bengal, India

Received: 09 November 2022
Accepted: 02 December 2022

***Correspondence:**
Dr. Abhishek Malakar,
E-mail: drabhishekmalakar@gmail.com

ABSTRACT

Background: Birth weight is an important predictor of an individual's survival and well-being and the complications of children born with low birth weight (LBW) continue till adulthood. The incidence and risk factors of LBW are not known in the Andaman and Nicobar Islands and research answers can help institute appropriate preventive measures. The aim of the study was to determine the proportion of LBW due to intrauterine growth restriction (IUGR) and preterm birth (PTB) and its association with selected factors.
Methods: The prospective study was conducted in Andaman and Nicobar Islands Institute of Medical Sciences amongst pregnant women admitted between January-June 2021. Women<18 years, with gestational age<28 weeks, and belonging to tribal groups were excluded. After delivery, birth-weight was recorded to the nearest 10 g in first hour.
Results: The incidence of LBW was 24% with 57% due to IUGR. It was significantly higher in recent immigrants, gravidity beyond three, smokeless tobacco uses during pregnancy, high risk pregnancies including multiple miscarriages and preterm deliveries. Five or more antenatal check-ups and > 6 Kg weight gain during pregnancy were protective.
Conclusions: Ensuring adequate antenatal check- ups and weight gain during pregnancy, control of tobacco exposure and quality care for women with recurrent abortions and high risk pregnancy is imperative, particularly targeting recent migrants. Strengthening ongoing family planning programmes to increase spacing, identifying pregnancies at risk of preterm deliveries and improved care of premature newborns should be a priority.

Keywords: Low birth weight, IUGR, Prematurity- risk assessment and prevention, Andaman and Nicobar islands

INTRODUCTION

Low birth weight (LBW) is perceived as ill health by the community and puts clinicians in an uneasy situation. Birth weight is an important predictor of an individual's survival and well-being. According to WHO, low birth weight (LBW) is defined as a birth weight less than 2500 (up to and including 2,499 g).[1] LBW is due to preterm birth (PTB), intrauterine growth restriction (IUGR), or both.[2] The complications of children born with LBW continue till adulthood. It includes greater mortality in neonatal and post neonatal period, malnutrition during childhood, low IQ and metabolic complications continuing through adulthood.[3-9] Globally, the prevalence of LBW was estimated to be 14.6% (95% CI: 12.4-17.1).[10] The target is to attain a 30% reduction in LBW prevalence in 2025 as compared to the 2012 rates. However, the progress is stagnant since 2000, across all WHO regions.[11] According to NFHS V conducted in India in the year 2019-20, the birth weight of 9% of children was not known. Among the rest of the children, the prevalence of LBW was 18%, same as that in 2015-16.[12] Several studies done across the country in different time periods has shown the prevalence to vary between 12% to 32%.[13-17] In Andaman and Nicobar Islands (ANI) the prevalence of low birth weight was 17.4% and 12% according to NFHS V and DLHS IV

respectively.[12,18] Research to identify causative factors over years found relations to societal structure, habits and ethnicity. Studies have identified several risk factors of LBW such as maternal age, education, socio economic factors, domestic violence, exposure to indoor air pollution and tobacco smoke during pregnancy, nutritional status and obstetric factors.[14,15,19,20,21-27] The proportion of LBW due to preterm births and risk factors of LBW are not known in these Islands. With this in mind, we conducted a study in the Andaman Islands, a place of diverse culture, population and geographical challenges. Research answers are immensely beneficial here, to institute appropriate action to reduce the incidence of LBW, and to prevent its complications, thereby decreasing the burden of referrals and treatment costs. The study was conducted to determine the proportion of LBW due to IUGR and PTB and to find the association of LBW with selected socio demographic, nutritional and obstetric factors.

METHODS

The prospective study was conducted in the labour ward of obstetrics and gynecology department of Andaman and Nicobar Islands Institute of Medical Sciences (ANIIMS), Port Blair. GB Pant hospital, is the teaching hospital and the only tertiary level hospital in ANI. It is located in South Andaman district, where about 87% of deliveries occur at government hospitals. Most deliveries of South Andaman Islands and complicated deliveries from North and Middle Andaman and Nicobar district are conducted in the study hospital. All pregnant women with gestational age>28 weeks, admitted in the study hospital for delivery were included in the study. Pregnant women with gestational age<28 weeks, pregnant women of age<18 years and pregnant women belonging to primitive tribal groups like Jarawas, Onges, Shompens and Great Andamanese were excluded.

Assuming 50% of low birth weight is due to IUGR, with 95% CI, a sample size of 385 was required. Consecutive sampling was adopted to select eligible participants. The antenatal mothers admitted for delivery during the study period (January-June 2021) were enrolled in the study after obtaining written informed consent. During their time of stay in the hospital, information was collected by face to face interview with a pretested semi structured questionnaire. The interview was conducted in Hindi by a trained interviewer, as Hindi is universally spoken in the islands. Data related to antenatal care like number of ante natal visits, weight gain during pregnancy and complications during ante natal period were crosschecked from routine clinical records (antenatal cards and in-patient case record) if available. Socio-economic status was calculated according to modified Kuppuswamy scale updated for 2019.[28] After delivery, the birthweight of the baby was recorded within the first one hour to nearest 10 g. Baby weighing scale with resolution of 10 g and zero adjustment facility was used to record the birth weight of the newborn. The gestational age was calculated from the reported last menstrual period. The gestational age was classified into very preterm (28 to 32 weeks) and moderate to late preterm (32-37 weeks), early term (37 0/7 weeks to 38 6/7 weeks), full term (39 0/7 weeks to 40 6/7 weeks), Late term (41 0/7 weeks to 41 6/7 weeks) and post term (42 0/7 weeks and beyond).[29,30] Data was entered using Epi Info 7, exported to MS Excel and analysed using R (v. 4.1.0). Data was summarised using frequency, percentage and mean, standard deviation. Bivariate analysis was performed using Chi-square test and Fischer exact test as appropriate. Ethical approval was obtained from Institutional Ethics Committee, ANIIMS. Written informed consent was obtained from study participants.

RESULTS

A total of 463 pregnant women consented to participate in the study. Socio-demographic distribution (Table 1) showed that more than half of the participants were in the age group of 22-31 years, were educated to the level of higher secondary or above and more than a third (37.8%) were from lower and lower middle class. Only 13% participants in our study were employed. Majority of the participants (82.5%) did not use fossil fuel like firewood, kerosene for cooking in their household. Nearly 5% were using smokeless tobacco during pregnancy and about 8% were exposed to passive smoke.

Distribution of participants according to residence, ethnicity and religion is given in Table 2. This distribution reflects the cultural diversity in ANI, because of migration of people from mainland India in various time periods. Most of the participants were settlers (41.9%) followed by pre-42 migrants (23.11%). Bengali and Tamil were the most common ethnic population encountered. About 22.5% participants were referred from nearby districts of North and Middle Andaman and Nicobar, while the rest were from South Andaman. Majority of participants were primigravida (49.46%) without any history of abortion (84.45%). More than three-fourth of them were booked cases and although most of them (93.52%) took regular iron folic acid supplements, anaemia was widely prevalent (56.4%). Most (53%) of the participants were of normal pre-pregnancy BMI and gained weight of 6-11 kg in their pregnancy. There were 128 (68%) participants with high risk, the most common of which is pregnancy induced hypertension (Table 3).

Three-fourth of participants delivered at term gestation and about 15.55% babies were born preterm. Out of 463, 111 babies were low birth weight, so the incidence of LBW in our study was 24% (95% CI: 20.21% to 28.18%) (Figure 1). More than 90% babies were healthy without any complications and among complications, fetal distress accounted for only 5.62% (Table 4). Out of the 111 LBW children, 48 (43.24%; 95% CI: 33.98 to 52.98) were preterm (Figure 2). In bivariate analysis (Table 5), incidence of LBW was significantly higher in recent immigrants to the Islands, number of gravidity beyond three, increasing number of miscarriages, among mothers using smokeless tobacco during pregnancy, pregnancies

with high risk factors and in preterm deliveries. Five or more antenatal checkups as well as weight gain during pregnancy of more than six kg were protective against LBW.

Table 1: Distribution of participants by socio-demographic factors.

Variables		Frequency (%)
Age (years)	18 to <22	85 (18.4)
	22 to <31	264 (57)
	31-45	114 (24.6)
Marital status	Married	454 (98.06)
	Unmarried	9 (1.94)
Education	Upto middle school	92 (19.9)
	High	105 (22.7)
	Higher secondary	132 (28.5)
	Graduate/PG/Prof	134 (28.9)
Occupation	Unemployed/housewife	401 (86.6)
	Employed	62 (13.4)
Socio-economic status	Lower and lower middle	175 (37.8)
	Upper lower	139 (30.02)
	Upper middle and upper	149 (32.18)
Fuel like firewood, kerosene	No	382 (82.5)
	Yes	81 (17.5)
Smokeless tobacco use	No	440 (95.03)
	Yes	23 (4.97)
Second hand smoking	No	428 (92.44)
	Yes	35 (7.56)

Table 2: Distribution of participants by residence, ethnicity and religion.

Variables		Frequency (%)
Resident status	Pre 42	107 (23.11)
	Settler	194 (41.90)
	Permanent resident	95 (20.52)
	Others	67 (14.47)
Ethnicity	Bengali	164 (35.42)
	Tamil	79 (17.06)
	Telugu	49 (10.58)
	Ranchi	63 (13.61
	Nicobarese	20 (4.32)
	Others	88 (19.01)
Religion	Hindu	331 (71.49)
	Muslim	60 (12.96)
	Christian	70 (15.12)
	Others	2 (0.43)
District	SA	359 (77.5)
	N and M	79 (17.1)

Table 3: Distribution of participants by obstetric factors.

Variables		Frequency (%)
Gravida	1	229 (49.46)
	2	153 (33.05)
	3	57 (12.31)
	≥4	24 (5.18)
Abortions	0	391 (84.45)
	1	57 (12.31)
	≥2	15 (3.24)
ANC checkups	≤4	62 (13.4)

Continued.

Variables		Frequency (%)
	5 to <11	358 (77.32)
	≥11	43 (9.29)
IFA consumption	No	30 (6.48)
	Yes	433 (93.52)
Pre-pregnant BMI	Underweight	69 (16.5)
	Normal	222 (53.1)
	Overweight	127 (30.4)
Weight gain during pregnancy (kg)	≤5	59 (14.1)
	6 to <12	261 (62.6)
	≥12	97 (23.3)
High risk pregnancy	Twin pregnancy	5 (1.08)
	PIH	66 (14.26)
	Diabetes	13 (2.81)
	Others	44 (9.5)
Anaemia	No	202 (43.6)
	Yes	261 (56.4)
Maternal height (cm)	<145	43 (10.3)
	145-<160	312 (74.6)
	≥160	63 (15.1)

Table 4: Distribution of participants by delivery and neonatal factors.

Variables		Frequency (%)
Period of gestation	Pre-term	72 (15.55)
	Term	349 (75.38)
	Post-term	15 (3.24)
Mode of delivery	Vaginal	250 (54)
	Assisted vaginal	7 (1.51)
	LSCS	206 (44.49)
Birth weight (g)	<2500	111 (24)
	≥2500	352 (76)
Sex of baby	Male	241 (52.1)
	Female	222 (47.9)
Complications	Congenital malformations	6 (1.3)
	Fetal distress	26 (5.62)
	Others	20 (4.32)
Outcome at birth	Alive and healthy	437 (94.38)
	Alive with complications	23 (4.97)
	Stillborn/neonatal death	3 (0.65)

Table 5: Bi-variable analysis of determinants of low birth weight.

Variables		Yes	No	OR (95% CI)	P value
Resident status	Pre 42	23 (20.72)	84 (23.87)	Ref	<0.0001
	Settler	38 (34.23)	156 (44.32)	0.89 (0.5 to 1.61)	
	Permanent resident	18 (16.22)	77 (21.88)	0.85 (0.42 to 1.7)	
	Others	32 (28.83)	35 (9.94)	3.34 (1.73 to 6.57)	
Ethnicity	Bengali	43 (38.74)	121 (34.38)	Ref	0.188
	Tamil	18 (16.22)	61 (17.33)	0.83 (0.43 to 1.54)	
	Telugu	9 (8.11)	40 (11.36)	0.63 (0.27 to 1.36)	
	Ranchi	21 (18.92)	42 (11.93)	1.41 (0.74 to 2.62)	
	Nicobarese and others	20 (18.02)	88 (25)	0.64 (0.35 to 1.15)	
Religion	Hindu	77 (69.37)	254 (72.16)	Ref	0.837
	Muslim	15 (13.51)	45 (12.78)	1.1 (0.57 to 2.04)	
	Christian and others	19 (17.12)	53 (15.06)	1.18 (0.65 to 2.09)	
District	SA	86 (77.48)	273 (77.56)	Ref	1
	N and M	19 (17.12)	60 (17.04)	1.01 (0.56 to 1.75)	

Continued.

Variables		Yes	No	OR (95% CI)	P value
	Nicobar	6 (5.41)	19 (5.4)	1 (0.36 to 2.46)	
Age (years)	18 to <22	18 (16.22)	67 (19.03)	Ref	0.4668
	22 to <31	61 (54.95)	203 (57.67)	1.12 (0.63 to 2.07)	
	31-45	32 (28.83)	82 (23.3)	1.45 (0.76 to 2.86)	
Marital status	Married	110 (99.09)	344 (97.73)	Ref	0.693*
	Unmarried	1 (0.001)	8 (2.27)	0.39 (0.05 to 3.16)	
Education	Upto middle school	18 (16.22)	74 (21.02)	Ref	0.7062
	High	25 (22.52)	80 (22.73)	1.28 (0.65 to 2.57)	
	Higher secondary	33 (29.73)	99 (28.13)	1.37 (0.72 to 2.66)	
	Graduate/PG/Prof	35 (31.53)	99 (28.13)	1.45 (0.77 to 2.81)	
Occupation	Unemployed/HW	91 (81.98)	310 (88.07)	Ref	0.101
	Employed	20 (18.02)	42 (11.93)	1.62 (0.91 to 2.9)	
Socio-economic status	Lower and LM	39 (35.14)	136 (38.64)	Ref	0.785
	Upper lower	34 (30.63)	105 (29.83)	1.13 (0.67 to 1.91)	
	UM and upper	38 (34.23)	111 (31.53)	1.19 (0.71 to 2.0)	
Fuel like firewood	No	94 (84.68)	288 (81.82)	Ref	0.488
	Yes	17 (15.31)	64 (18.18)	0.81 (0.45 to 1.46)	
Gravida	1	59 (53.15)	170 (48.3)	Ref	0.045
	2	27 (24.32)	126 (35.8)	0.62 (0.37 to 1.02)	
	3	15 (13.51)	42 (11.93)	1.03 (0.52 to 1.96)	
	≥4	10 (9)	14 (3.98)	2.05 (0.85 to 4.85)	
Abortions	0	86 (77.48)	305 (86.65)	Ref	0.03
	1	18 (16.22)	39 (11.08)	1.64 (0.87 to 2.97)	
	≥2	7 (6.31)	8 (2.27)	3.1 (1.06 to 8.88)	
ANC checkups	≤4	23 (20.72)	39 (11.08)	Ref	0.02
	5 to <11	81 (72.97)	277 (78.69)	0.5 (0.28 to 0.89)	
	≥11	7 (6.31)	36 (10.22)	0.33 (0.12 to 0.83)	
IFA consumption	No	6 (5.41)	24 (6.82)	Ref	0.759
	Yes	105 (94.59)	328 (93.18)	1.28 (0.51 to 3.22)	
Pre-pregnant BMI	Underweight	23 (21.69)	46 (14.74)	1.72 (0.94 to 3.09)	0.193
	Normal	50 (47.17)	172 (55.13)	Ref	
	Overweight	33 (31.13)	94 (30.13)	1.21 (0.72 to 1.99)	
Weight gain during pregnancy (kg)	≤5	21 (19.81)	38 (12.22)	Ref	0.039
	6 to <12	68 (64.15)	193 (62.06)	0.63 (0.35 to 1.18)	
	≥ 12	17 (16.04)	80 (25.72)	0.38 (0.18 to 0.81)	
Smokeless tobacco use	No	101 (90.99)	339 (96.31)	Ref	0.045
	Yes	10 (9)	13 (3.69)	2.58 (1.1 to 6.06)	
Second hand smoking	No	100 (90.09)	328 (93.18)	Ref	0.385
	Yes	11 (9.9)	24 (6.82)	1.5 (0.71 to 3.18)	
High risk pregnancy	No	71 (63.96)	264 (75)	Ref	0.023
	Yes	40 (36.04)	88 (25)	1.69 (1.07 to 2.67)	
Anaemia	No	50 (45.05)	152 (43.18)	Ref	0.73
	Yes	61 (54.95)	200 (56.82)	0.93 (0.6 to 1.42)	
Maternal height (cm)	<145	12 (11.32)	31 (9.94)	Ref	0.92
	145-<160	82 (77.36)	230 (73.72)	0.92 (0.46 to 1.94)	
	≥160	12 (11.32)	51 (16.35)	0.61 (0.24 to 1.53)	
Period of gestation	Term	52 (50.98)	297 (88.92)	Ref	<0.0001
	Preterm	48 (47.06)	24 (7.19)	11. 42 (6.52 to 20.53)	
	Post term	2 (1.97)	13 (3.89)	0.88 (0.13 to 3.30)	
Sex of baby	Male	57 (51.35)	184 (52.27)	Ref	0.865
	Female	54 (48.65)	168 (47.73)	1.04 (0.68 to 1.59)	

Note: HW- housewife, LM- Lower Middle, UM – Upper Middle, *Fischer exact test.

Table 6: Comparison of incidence of LBW in various states in India.

S. no.	State	Percentage (LBW)	Investigators
a.	Andaman and Nicobar	24	Present study

Continued.

S. no.	State	Percentage (LBW)	Investigators
b.	Odissa	27.76	Bhue et al
c.	West Bengal	21.49	Pal et al
d.	Uttar Pradesh	32.3	Agarwal et al
e.	Haryana	17	Kumar et al
f.	Maharashtra	24.18	Digole et al
g.	Andhra Pradesh	26.8	Swarnalatha et al
h.	Telengana	26	Apoorva et al
i.	Karnataka	22.9	Metgud et al
j.	Tamil Nadu	24	Geetha et al

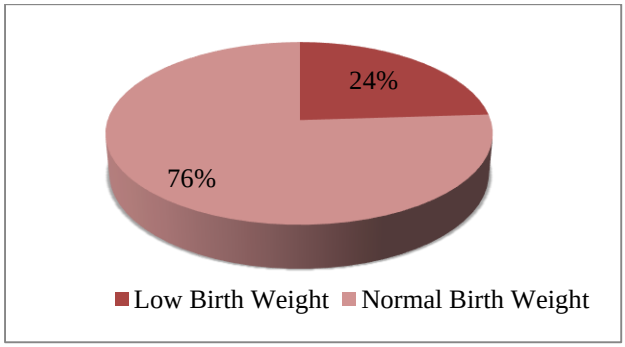

Figure 1: Incidence of LBW in our study.

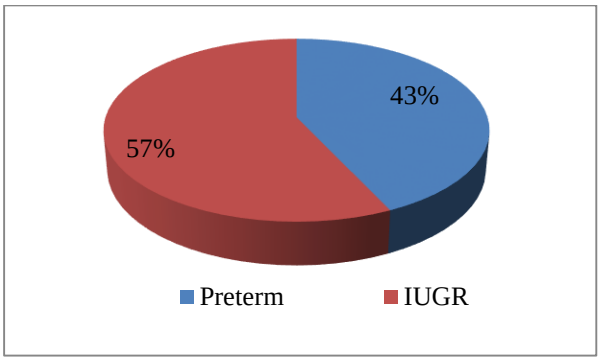

Figure 2: Percentage of LBW due to pre-term birth and IUGR (intra uterine growth restriction).

DISCUSSION

The incidence of LBW in this study was 24%, similar to that reported in other studies with a range of 17-32% (Table 6).[31-35] IUGR was the predominant cause of LBW (57%) in the study as that is prevalent in South Asian Countries.[36] However, in developed countries, preterm births are the most common cause of LBW10. While the aetiology and prevention of preterm births is more complex, IUGR in contrast is still amenable to nutritional interventions.[37] Thus there is a great scope for reducing LBW due to IUGR in the Islands.

In the bivariate analysis, the following factors were identified as risk factors of LBW: recent migration to the Islands, number of gravidity beyond three, increasing number of miscarriages, less than four ANC visits, less weight gain, use of smokeless tobacco during pregnancy, high risk pregnancies and preterm deliveries. With regard to resident status, the 'others' group comprise of people who have migrated from mainland India and lived in the Islands for less than 10 years as compared to pre 42 settlers and permanent residents. Thus, the migrants may be disadvantaged by socio-economic status, educational levels, health seeking behaviour and social support system. Studies have documented the high prevalence of LBW among the migrants within the country and internationally.[38,39] The effect of gravidity on LBW may be indirectly due to maternal malnutrition caused by frequent childbearing at short intervals.[40] This is also reflected in the association between weight gain during pregnancy and LBW.[26,27] Women who gained less than six kilograms have greater risk of delivering babies with LBW. The underlying ethology of previous spontaneous abortions could result in current PTB or IUGR.[41] High risk pregnancies such as pregnancy induced hypertension (PIH), gestational diabetes, have a greater risk of LBW.[42-44] Any pregnancy complication impairs utero-placental blood perfusion or hastens the termination of pregnancy and hence results in LBW.[42-44] Prolonging a pregnancy to term gestation was found to be of utmost importance, when it was seen in our study that LBW was more than ten times in preterm babies. As expected, smokeless tobacco use was positively associated with LBW. In ANI, prevalence of tobacco use among women was 31% which was considerably higher than the national average of 9%.[12] Tobacco use during pregnancy according to the current study was 5%, and the risk of LBW was about 3%. Several studies have documented the effect of smokeless tobacco use during pregnancy on birth weight, duration of gestation and still birth.[45,46] Possible mechanisms suggested were increased risk for infections, depletion of langerhans cells, increase in inflammatory cytokines, reduced zinc levels, increase in contractility of myometrium, alterations in collagen integrity, fetal hypoxia, fetal nutritional changes or action of polycyclic aromatic hydrocarbons.[47]

This is the first study done in Andaman Nicobar Islands to document the causes of LBW. The study population is representative, and the interviews are conducted by trained interviewers prior to delivery which enhanced the accuracy of information. Comprehensive list of risk factors were used in the questionnaire.

Limitations

One limitation of the study could be that the weighing scale used was not standardised and could only measure to

a nearest ten grams which could have resulted in misclassification of birth weights of newborns. In this study we found out that still IUGR was the predominant cause of LBW in South Andaman. Thus, prevention programmes in the islands should on priority target recent migrants, ensuring more than five antenatal checkups, and weight gain more than six kg during pregnancy. Simultaneously, sufficient attention should be provided for family planning programmes to limit the number of pregnancies, and provision of quality ante-natal care for women with recurrent abortions and high risk factors which will also help in identifying mothers at risk of preterm deliveries. Once identified, targeted antenatal care to those women can help prolong the pregnancy to some extent thereby reducing low birth weight from preterm birth and its related morbidities. Nonetheless, efforts to strengthen infrastructure to take care of preterm low birth weight newborns is paramount, particularly in an island. Awareness programmes on tobacco control should specifically address the harmful effects of tobacco use and exposure during pregnancy.

ACKNOWLEDGMENTS

All the authors would like to express their gratitude and thanks to the study participants and the Department of Obstetrics and Gynaecology, Andaman and Nicobar Islands Institute of Medical Sciences, Port Blair who gave permission to conduct this study and cooperated in every possible means.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. WHO. WHA Global Nutrition Targets 2025: Low birth weight policy brief. Available at: https://apps.who.int/iris/bitstream/handle/10665/0/WHO_NMH_NHD_14.5_eng.pdfua=1. Accessed on 07 January 2020.
2. Cutland CL, Lackritz EM, Mallett-Moore T, Bardají A, Chandrasekaran R, Lahariya C, et al. Low birth weight: Case definition & guidelines for data collection, analysis, and presentation of maternal immunization safety data. Vaccine. 2017;35(48):6492-500.
3. McCormick MC. The contribution of low birth weight to infant mortality and childhood morbidity. N Engl J Med. 1985;312(2):82-90.
4. Million Death Study Collaborators. Changes in cause-specific neonatal and 1-59-month child mortality in India from 2000 to 2015: a nationally representative survey. Lancet. 2017;390(10106):1972-80.
5. Christian P, Lee SE, Donahue AM, Adair LS, Arifeen SE, Ashorn P, et al. Risk of childhood undernutrition related to small-for-gestational age and preterm birth in low- and middle-income countries. Int J Epidemiol. 2013;42(5):1340-55.
6. Gu H, Wang L, Liu L, Luo X, Wang J, Hou F, et al. A gradient relationship between low birth weight and IQ: A meta-analysis. Sci Rep. 2017;7(1):18035.
7. Jornayvaz FR, Vollenweider P, Bochud M, Mooser V, Waeber G, Marques-Vidal P. Low birth weight leads to obesity, diabetes and increased leptin levels in adults: the CoLaus study. Cardiovasc Diabetol. 2016;15:73.
8. Chen LH, Chen SS, Liang L, Wang CL, Fall C, Osmond C, Veena SR, Bretani A. Relationship between birth weight and total cholesterol concentration in adulthood: A meta-analysis. J Chin Med Assoc. 2017;80(1):44-9.
9. Knop MR, Geng TT, Gorny AW, Ding R, Li C, Ley SH, et al. Birth Weight and Risk of Type 2 Diabetes Mellitus, Cardiovascular Disease, and Hypertension in Adults: A Meta-Analysis of 7 646 267 Participants From 135 Studies. J Am Heart Assoc. 2018;7(23):e008870.
10. Blencowe H, Krasevec J, de Onis M, Black RE, An X, Stevens GA, et al. National, regional, and worldwide estimates of low birthweight in 2015, with trends from 2000: a systematic analysis. Lancet Glob Health. 2019;7(7):849-60.
11. UNICEF. Low Birth weight, 2020. Available at: https://data.unicef.org/topic/nutrition/lowbirthweight. Accessed on 07 January 2020.
12. International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-5), 2019-21: India. Mumbai: IIPS, 2021. Available at: http://rchiips.org/nfhs/NFHS-5Reports/NFHS-5_INDIA_REPORT.pdf. Accessed on 08 June 2022.
13. Balaji K, Sankar S, Nandagopal B. Low birth weight of newborns: magnitude of the problem seen in a 100 bed hospital of a rural area in vellore district, Tamil Nadu (India). Indian J Community Med. 2010;35(2):362-4.
14. Kumar M, Verma R, Khanna P, Bhalla K, Kumar R, Dhaka R,et al. Prevalence and associated factors of low birth weight in North Indian babies: a rural based study. Int J Community Med Public Health. 2017;4(9):3212-7.
15. Metgud CS, Naik VA, Mallapur MD. Factors affecting birth weight of a newborn--a community based study in rural Karnataka, India. PLoS One. 2012;7(7):e40040.
16. Bhilwar M, Upadhyay RP, Yadav K, Kumar R, Chinnakali P, Sinha S, Kant S. Estimating the burden of 'weighing less': A systematic review and meta-analysis of low birth-weight in India. Natl Med J India. 2016;29(2):73-81.
17. Kumari S, Garg N, Kumar A, Guru PKI, Ansari S, Anwar S, et al. Maternal and severe anaemia in delivering women is associated with risk of preterm and low birth weight: A cross sectional study from Jharkhand, India. One Health. 2019;8:100098.
18. International Institute for Population Sciences. District level health survey, Andaman and Nicobar

Island, fact sheet, 2020. Available at: http://rchiips.org/pdf/dlhs4/report/AN.pdf. Accessed on 07 January 2020.
19. Sachdev HPS. Low birthweight in South Asia. Int J Diab Dev Countries. 2001;21:13-31.
20. Johnson CD, Jones S, Paranjothy S. Reducing low birth weight: prioritizing action to address modifiable risk factors. J Public Health (Oxf). 2017;39(1):122-31.
21. Silvestrin S, Silva CH, Hirakata VN, Goldani AA, Silveira PP, Goldani MZ. Maternal education level and low birth weight: a meta-analysis. J Pediatr (Rio J). 2013;89(4):339-45.
22. Marimuthu Y, Sarkar S, Kattimani S, Krishnamoorthy Y, Nagappa B. Role of Social Support and Spouse Abuse in Low Birth Weight: A Case-control Study from Puducherry, India. Indian J Community Med. 2019;44(1):12-6.
23. WHO. Indoor air pollution from solid fuels and risk of low birth weight and stillbirth : report from a symposium held at the Annual Conference of the International Society for Environmental Epidemiology (ISEE, 2020), 2020. Available at: https://apps.who.int/iris/bitstream/handle/10665/437 66/9789241505735_eng.pdf?sequen ce=1. Accessed on 07 January 2020.
24. Sen J, Roy A, Mondal N. Association of maternal nutritional status, body composition and socio-economic variables with low birth weight in India. J Trop Pediatr. 2010;56(4):254-9.
25. Salunkhe AH, Pratinidhi AK, Salunkhe JA, Kakade SV, Mohite VR, Patange RP. Antenatal Risk Scoring Scale for Predication of Low Birth Weight and Its Validity. Indian J Community Med. 2019;44(2):97-101.
26. Kramer MS. Determinants of low birth weight: methodological assessment and meta-analysis. Bull World Health Organ. 1987;65(5):663-737.
27. Patel A, Prakash AA, Das PK, Gupta S, Pusdekar YV, Hibberd PL. Maternal anemia and underweight as determinants of pregnancy outcomes: cohort study in eastern rural Maharashtra, India. BMJ Open. 2018;8(8):e021623.
28. Wani RT. Socioeconomic status scales-modified Kuppuswamy and Udai Pareekh's scale updated for 2019. J Family Med Prim Care. 2019;8(6):1846-9.
29. WHO. Preterm, 2020. Available at: https://www.who.int/newsroom/factsheets/detail/preterm-birth. Accessed on 07 January 2020.
30. ACOG. Committee opinion on Definition of term pregnancy, 2020. Available at: https://www.acog.org//media/CommitteeOpinions/CommitteeonObstetricPractice/co579.pdf?dmc=1&ts=20200108T0948587742. Accessed on 08 January 2020.
31. Kumar M, Verma R, Khanna P, Bhalla K, Kumar R, Dhaka R, et al. Prevalence and associate factors of low birth weight in North Indian babies: a rural based study. Int J Community Med Public Health 2017;4:3212-7.
32. Pal A, Manna S, Das B. The risk of low birth weight and associated factors in West Bengal, India: a community based cross-sectional study. Egypt Pediatric Association Gaz. 2020;68:27.
33. Geetha E. Prevalence of Low Birth Weight And Its Determinants In An Urban Area Of Kancheepuram District, Tamil Nadu. Annals of RSCB. 2021;25(1):2889-901.
34. Bhue PK, Acharya HP, Pradhan SK, Biswal P, Swain AP, Satapathy DM. Sociodemographic factors associated with low birth weight in a tertiary care hospital of Odisha. Int J Community Med Public Health 2018;5:1797-802.
35. Agarwal A, Goel K, Kumar V, Goel P, Garg M, et al. Maternal Risk Factors Associated with Low Birth Weight Neonates in a Tertiary Care Hospital, Northern India. J Comm Med Health Edu. 2012;2:9.
36. Lee AC, Katz J, Blencowe H, Cousens S, Kozuki N, Vogel JP, et al. National and regional estimates of term and preterm babies born small for gestational age in 138 low-income and middle-income countries in 2010. Lancet Glob Health. 2013;1(1):e26-36.
37. UNICEF. 1 in 7 babies worldwide born with a low birthweight - The Lancet Global Health, UNICEF, WHO, 2022. Available at: https://www.unicef. releases/globalhealtunicef-who. Accessed on 13 June 2022.
38. Hamilton ER, Choi KH. The mixed effects of migration: community-level migration and birthweight in Mexico. Soc Sci Med. 2015;132:278-86.
39. Urquia ML, Glazier RH, Blondel B, Zeitlin J, Gissler M, Macfarlane A, et al. International migration and adverse birth outcomes: role of ethnicity, region of origin and destination. J Epidemiol Community Health. 2010;64(3):243-51.
40. Mekie M, Taklual W. Magnitude of low birth weight and maternal risk factors among women who delivered in Debre Tabor Hospital, Amhara Region, Ethiopia: a facility based cross-sectional study. Ital J Pediatr. 2019;45(1):86.
41. Brown JS, Adera T, Masho SW. Previous abortion and the risk of low birth weight and preterm births. J Epidemiol Community Health. 2008;62(1):16-22.
42. Rahman LA, Hairi NN, Salleh N. Association between pregnancy induced hypertension and low birth weight; a population based case-control study. Asia Pac J Public Health. 2008;20(2):152-8.
43. Getaneh T, Negesse A, Dessie G, Desta M. The impact of pregnancy induced hypertension on low birth weight in Ethiopia: systematic review and meta-analysis. Ital J Pediatr. 2020;46(1):174.
44. Silveira LRPD, Schmidt MI, Reichelt AAJ, Drehmer M. Obesity, gestational weight gain, and birth weight in women with gestational diabetes: the LINDA-Brasil (2014-2017) and the EBDG (1991-1995) studies. J Pediatr (Rio J). 2021;97(2):167-76.
45. Inamdar AS, Croucher RE, Chokhandre MK, Mashyakhy MH, Marinho VC. Maternal Smokeless Tobacco Use in Pregnancy and Adverse Health

Outcomes in Newborns: A Systematic Review. Nicotine Tob Res. 2015;17(9):1058-66.
46. Gupta PC, Subramoney S. Smokeless tobacco use, birth weight, and gestational age: population based, prospective cohort study of 1217 women in Mumbai, India. BMJ. 2004;328(7455):1538.
47. Centers for Disease Control and Prevention (US); National Center for Chronic Disease Prevention and Health Promotion (US); Office on Smoking and Health (US). How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease: A Report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention; 2010.

Cite this article as: Stephen LC, Barik S, Malakar A. Incidence and determinants of low birth weight in a tertiary hospital at South Andaman: a prospective study. Int J Reprod Contracept Obstet Gynecol 2023;12:206-14.