

Original Research Article

A Study to Establish the Gestational Age and Sex Specific Percentile Charts of Ponderal Index of Newborns for Local Population of Semi Desert Area of Rajasthan

Dr. Swati Agrawal¹, Dr. Jitendra Prasad Bhatnagar², Dr. Virendra Kumar Gupta³, Dr. Shagun Gupta⁴, Dr. Jagdish Prasad Agrawal⁵, Dr. Preeti Gusain⁶, Dr. Ravi Garg⁷, Dr. Amandeep Kaur⁸, Dr. Kasturi devatwal⁹, Dr. Alok Purohit¹⁰

¹Resident, Department Of pediatrics, NIMS University, Jaipur, India

²Assistant Professor, Department Of pediatrics, NIMS University, Jaipur, India

³Assistant Professor, Department Of pediatrics, NIMS University, Jaipur, India

⁴Assistant Professor, Department Of Obstetric & gynaecology, NIMS University, Jaipur, India

⁵Assistant Professor, Department Of pediatrics, NIMS University, Jaipur, India

^{6,7,8} Resident, Department Of pediatrics, NIMS University, Jaipur, India

⁹Resident, Department Of Obstetric & gynaecology, NIMS University, Jaipur, India

¹⁰Professor & HOD, Department Of pediatrics, NIMS University, Jaipur, India

*Corresponding author

Dr. Virendra Kumar Gupta

Email: vk.hindustani@gmail.com

Abstract: Growth of fetus is dependent on multiple factors related to Fetal, Maternal, Placental and Environmental factors. Ponderal Index proves to be a good index of growth estimation. Also ponderal index can differentiate between acute, subacute and chronic malnutrition. Aim of the study is to set the gestational age and sex specific percentile charts of ponderal index of newborns and to identify high risk vs low risk babies according to low, appropriate or high ponderal index in future follow up. The mean, standard deviation, 3rd, 5th, 10th, 50th, 90th, 95th and 97th percentiles of PI were calculated and their corresponding curves were drawn according to fetal age & sex. In present study it was observed that as gestational age increases from 25 to 43 weeks, there was progressive increase in PI. But at 31st and 34th week in females and 31st 32nd and 34th week in males' sharp growth was seen which denotes maximum growth of fetus in utero. As such there is no significant difference found in PI is seen in males and females. We can use the reference percentile charts of PI to know the outcome of infant in early life.

Keywords: Gestational age; Ponderal Index; Percentile Charts; Growth charts

INTRODUCTION

Fetal growth is interplay between fetal, maternal, placental and environmental factors [1]. Seeds of growth related abnormalities are sown in intrauterine period as it is a period of maximum growth. Weight has been the most important criteria for assessment of growth but it only picks up changes occurring acutely which may be days to a few weeks. Length proves to be a better index of growth in sub-acute and chronic stage of deprivation or excess [2]. Head circumference and abdominal circumference on the other hand would assess the growth in totality particularly chronic states of nutritional variations.

There are no curves of growth of PI in preterm babies from 25 weeks till birth during which growth of fetus in utero occurs. Therefore, incorporation of a combination of weight and length as a measure of growth may be a good parameter to assess the growth in totality i.e. acute vs subacute vs chronic individually and in combination. Therefore, to assess the true growth in totality we should involve a combination of all the above said factors, and assess the cases where growth may get affected. To circumvent this problem of assessment of growth parameters which involves weight and length i.e. PONDERAL INDEX which involves both would be the ideal parameter of true growth in utero. In this study we have described gestational Age and Sex Specific Percentile Charts of Ponderal Index of

Newborns for Local Population of Semi Desert Area of Rajasthan.

AIMS AND OBJECTIVES

1. To set the gestational age and sex specific percentile charts of ponderal index of newborns.
2. To identify high risk vs low risk babies according to low, appropriate or high ponderal index in future follow up.

MATERIALS AND METHODS

In this prospective observational study, total 503 neonates after obtaining clearance from Institutional Ethical Committee and informed consent from the parent/guardian of every patient who are part of this study, born over the period of January 2015 to June 2016 at NIMS Hospital Medical College and research centre, Jaipur (Rajasthan), were included. All subjects were examined within 72 hours of birth by a single observer using predefined method (J. Hall, 1989). Maternal antenatal history and LMP (last menstrual period) were obtained from gynaecology and obstetrics ward and were recorded. Gestational age was determined from the first day of LMP (or 1st trimester sonography) and this was recorded in completed weeks and cross checked with the extended Ballard score. Exclusion criteria included all extramural births, cases with gross congenital anomalies, maternal diseases known to affect fetal growth like hypertension, diabetes mellitus, multiple pregnancy, unknown LMP and where the gestational age calculated by LMP and USG differed by ≥ 2 weeks.

Birth weight, length were measured and PI was calculated by applying the formula- $PI = \frac{wt \text{ (in kgs)}}{(ht \text{ in mts})}^3$. Using Microsoft Excel spreadsheet, mean, standard deviation, 3rd, 5th, 10th, 50th, 90th, 95th and 97th percentiles were calculated and their corresponding curves were drawn. Charts according to sex were also drawn.

OBSERVATION AND RESULTS:

In our study most of population belonged to rural class (95%) in comparison to urban class (5%). Maximum mothers belonged to age group of 21-25 yrs ie 52.29%, 30.42% belonged to age group of 26-30 yrs, 10.74 & 6.16% in age groups of 31-35 and < 20 yrs respectively. 46% mothers were primipara while 27.7%, 17%, 7.1% and 2.2% were of second, third, fourth and more than fourth gravida respectively. 65.30% babies were delivered by normal vaginal delivery, 33.9% by LSCS (Lower segment caesarean section). Of the 503 subjects studied, 272 (54.08%) were females and 231 (45.92%) were males. The majority of the neonates were in 38 and 39 weeks (16.9% & 17.69% each) while the extremes accounted for the smallest portions namely 0.2% by 25 weeks & 26 weeks, 1.1% by 27 weeks and 0.6% by 43 weeks of gestation.

Figure-1 and 2 showing percentile charts of PI of male and female newborns of each gestation age respectively with correlation of sex (Figure 3). At 28 weeks, the mean PI was minimum 1.98 ± 0.10 . From 32 to 42 weeks there was a steady increase in PI with fluctuations at 30th and 33rd week and maximum at 42 weeks of gestational age (2.65 ± 0.28) (Table-1).

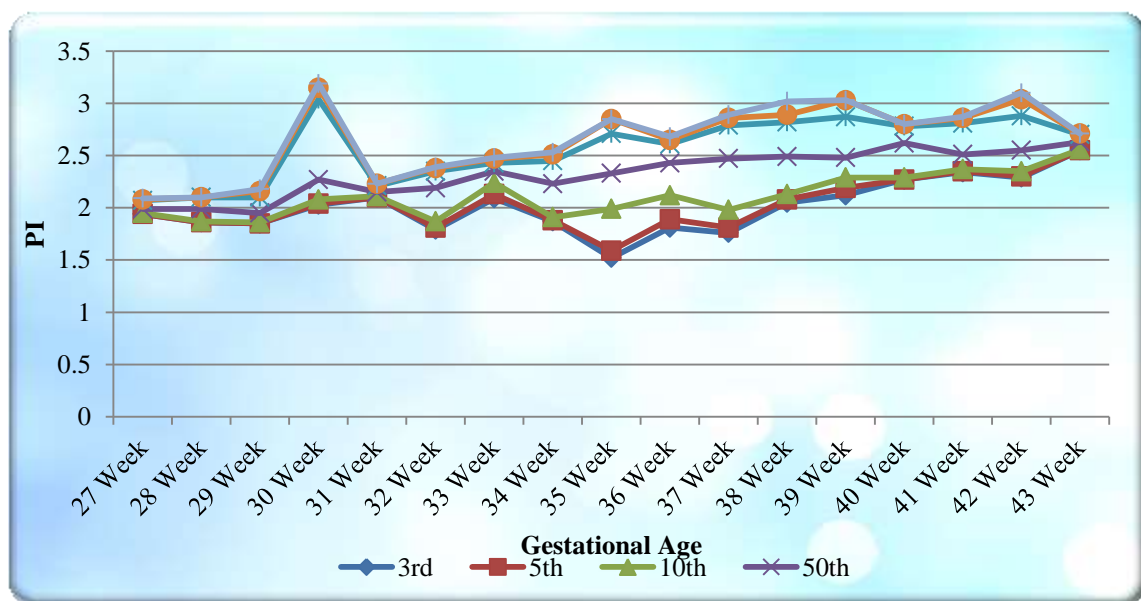


Fig 1: Percentile charts of PI of male newborns of each gestation age

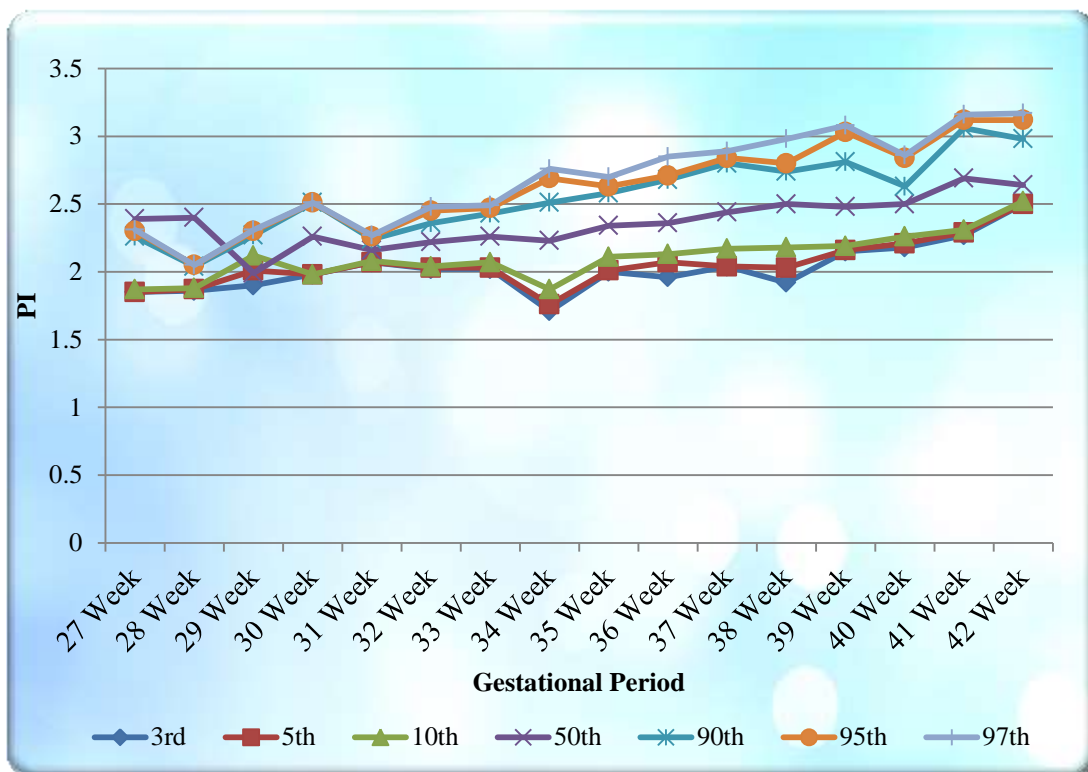


Fig 2: Percentile charts of PI of female newborns of each gestation age

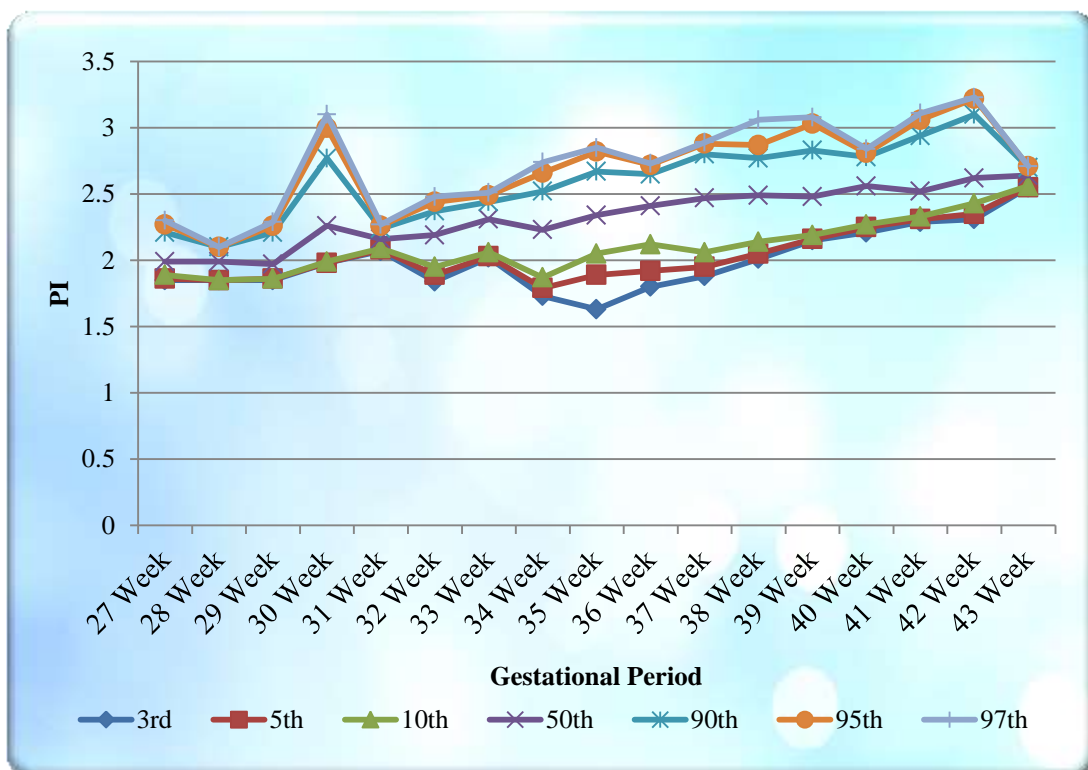


Fig 3: Percentile charts of PI of newborns of each gestation age

Table-1: Mean PI and standard deviation of newborns in each gestation age

GA (weeks)	N	Mean	Std. Deviation
26	1	2.73	
27	6	2.03	0.06
28	10	1.98	0.10
29	12	2.02	0.15
30	13	2.35	0.36
31	13	2.16	0.17
32	15	2.16	0.20
33	24	2.28	0.34
34	15	2.2	0.31
35	36	2.34	0.30
36	40	2.39	0.26
37	63	2.46	0.29
38	85	2.47	0.28
39	89	2.50	0.26
40	37	2.54	0.18
41	27	2.61	0.26
42	13	2.65	0.28
43	3	2.63	0.09

DISCUSSION

Maximum growth period of babies is seen in intrauterine life. There are no growth curves of PI in preterm babies from 25 weeks till birth. Therefore, incorporation of a combination of weight and length as a measure of growth may be a better parameter to assess the growth in totality i.e. acute vs subacute vs chronic individually and in combination. The study presents the percentile curves of ponderal index in relation to age and sex. This is first study from India involving neonates from 24 to 43 weeks of gestation whose PI is being observed. By this study we are trying to lay down reference charts of ponderal indices.

In present we observed progressive increase in PI from 25 to 43 weeks. At 31st and 34th week in females and 31st 32nd and 34th week in males growth spurt was seen which can be due to certain maternal, neonatal or placental factors which are responsible for sharp growth of babies at this particular gestation (Figure 1& 2). While no significant difference was found in PI in males and females (Figure 3). Progressively increasing PI shows that velocity of growth is maximum in earlier weeks of gestational age. On comparing with studies done abroad ie. Olufemi *et al.*; [3]; Fok TK *et al.*; [4]) the mean value of PI was found lower in our study while results are close with Saroha H *et al.*; [5] and Yadav R in 2016 [6]. This could be due to the fact that these studies were done in same setting, dealing with almost same population and geographical area then previous studies done in different racial factors. In spite of all best efforts in calculating the percentiles using the cohort and also applying best statistical methods, this study still have

few limitations like small sample size & exclusion of some condition like pregnancy induced hypertension and gestational diabetes was always not possible.

CONCLUSION

Velocity of growth is maximum in earlier weeks of gestational age which can be attributed by progressively rising in PI. We can use the reference percentile charts of PI to know the outcome of infant in early life and also helps clinician to predict risk and counsel parents accordingly.

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REFERENCES

1. Regnault TR, Limesand SW, Hay Jr WW. Factors influencing fetal growth. *Neo Reviews*. 2001 Jun 1;2(6):e119-28.
2. Patricia Queen Samour, Kathy King (RD.), Handbook of Pediatric Nutrition (3rd edition); chapter 18 Growth failure page; 394-395
3. Oluwafemi O, Njokanma F, Disu E, Ogunlesi T. The current pattern of gestational age-related anthropometric parameters of term Nigerian neonates. *South African Journal of Child Health*. 2013 Jan; 7(3):95-9.
4. Fok TF, So HK, Wong E, Ng PC, Chang A, Lau J, Chow CB, Lee WH. Updated gestational age specific birth weight, crown-heel length, and head

circumference of Chinese newborns. Archives of Disease in Childhood-Fetal and Neonatal Edition. 2003 May 1; 88(3):F229-36.

5. Saroha H, Purohit A. To lay down the reference values of intrauterine growth with particular reference to body mass index of preterm, term and post term neonates in a rural setting (Rajasthan). Indian Journal of Basic and Applied Medical Research. 2015; 5(1):645-650.
6. Yadav R, Bhatnagar JP, Yadav G, Verma R, Gupta S, Gupta VK, Bhatia S, Purohit A. Gestational age assessment in newborns using regression equation of anthropometric parameters singly or in combination. International Journal of Biomedical Research. 2016 Aug 30; 7(8):600-5.