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**Original Research Article**

# Maternal determinants for 4 Ds in children registered under Rashtriya Bal Swasthya Karyakram program at an urban health centre of Ahmedabad

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## ABSTRACT

**Background:** Maternal determinants influence the outcome of pregnancy and child's health in early years. Rashtriya Bal Swasthya Karyakram (RBSK) deals with the 4 D (birth defects, chronic diseases, deficiency disorders and developmental delays) among children (from birth till 18th years). Objectives were to determine and document the association between maternal determinants especially antenatal care (ANC) and 4 Ds and suggest preventive measures.
**Methods:** Out of 302 children with 4 D's registered during April 2018-March 2020, 102 children were selected using probability proportionate to sample size (PPS) sampling for each category of 4D. Information of socio demographic details and maternal determinants was gathered on a semi structured questionnaire by interviewing mothers/caretaker.
**Results:** Relevant information could be gathered from 96 caregivers/parents. Mean maternal age was 26.4±4.1 years. Congenital defects were significantly associated with higher maternal age ($p<0.0001$). Out of 102 cases under study, minimum recommended 4 ANC visits were not taken by 17 (17.7%) mothers. Also, 13 (13.5%) did not take IFA supplementation. Poor health status during pregnancy, was significantly associated for deficiency disorders of child in later life ($p<0.04$).
**Conclusions:** Maternal age at pregnancy, health status of mother, ANC care (number of ANC visits, IFA supplementation), health seeking behaviour, birth weight and birth order of child were major determinants of 4Ds.

**Keywords:** ANC care, Child health, 4 D's, Maternal determinants, Outcome of pregnancy, RBSK

## INTRODUCTION

A newborn's life does not start when it comes out of the uterus, but much early from the day of conception. Entire process from zygote- to- embryo- to- fetus is significantly influenced by maternal determinants. Throughout this period, adequate levels of key nutrients are required to support pregnancy, fetal growth, breastfeeding. Inadequate levels influence child health adversely and predispose them to chronic diseases and deficiency disorders in later life.[1-3] Birth weight is a crucial indicator for the identification and classification of adverse health outcomes in children.[4] Low birth weight (LBW)and severe acute malnutrition (SAM) in children in later years are associated with antenatal malnutrition (undernutrition).[5] Advanced maternal age at pregnancy is increasing in women due to improved education and job opportunities which together delay the marriage and the conception which is a known risk factors for negative obstetric outcomes especially the birth defects.[6] Overall, 2-4% of live births involve birth defects which carry significant medical, surgical, or lifestyle consequences.[7]

Dividends of early intervention would be huge including improvement of survival, reduction of malnutrition prevalence, enhancement of cognitive development and educational attainment and overall improvement of quality of life of our citizens.[8] Maternal risk factors identification may be helpful in planning the intervention required during pregnancy in preventing 4 Ds (defect, diseases, deficiency and developmental delay) which are identified and managed through RBSK program from birth to 18th year of life and significantly improve wellbeing of all children.

With this background, objectives were framed to (1) determine the association between maternal determinants and 4 Ds in the children and (2) document the role of antenatal care in outcome of pregnancy to suggest preventive measures.

## METHODS

It was a retrospective study, conducted at Urban Health Centre (UHC) Ognaj (N=3,00,599), a field practice area and urban health training centre (UHTC) of community medicine department of a medical college of Ahmedabad. Two cohorts of children registered and referred for 4Ds during April 2018 to March 2019 (1st cohort, N=177) and April 2019 to March 2020 (2nd cohort, N=131). As per the logistic feasibility, 51case from each cohort were picked up. Probability proportionate to size (PPS) method was used to pick up cases from each of 4 D categories; within each category of 4 D, the required study subjects were selected randomly. Thus, a total 102 cases (@ 51per cohort were identified for the study, however, mothers/care givers of only 96 could be interviewed. The data was collected by interviewing mothers at home on a pre-designed pretested semi-structured questionnaire. Home visits with prior appointment (as per convenience of mother/care giver) were undertaken by trained investigators. While fixing the appointment, oral consent was taken for home visit on telephone, and written consent was obtained before taking the personal interview of mother. Mothers unwilling to participate and those who could not be contacted after 2 visits were excluded. Study was approved by Institutional Ethics Committee. Data confidentiality was maintained and patient identity was removed in final report. Percentage and proportions were used for descriptive statistics and chi square test was used for finding the association. P value of <0.05 was considered statistically significant.

## RESULTS

Information could be gathered from 96 mothers/ caregivers of children affected with any of 4D. Most common 4 Ds was birth defects seen in 46 (47.9%) followed by deficiency disorders in 39 (40.6%), chronic diseases in 10 (10.4%) and developmental delays in 1 (1.04%) (Table 1). Birth defects and deficiency disorders together accounted for 85 (88.5%) cases; hence the subsequent analysis to study the impact of antenatal factors was restricted only to birth defects and deficiency disorders. Mean maternal age at the time of birth of affected child was 26.4±4.1 years. More than half (49) mothers conceived before 25 years including 4 teenage pregnancies, while 10 mothers were aged more than 30 years. Out of 40 children with nutritional deficiency, 37 (92%) mothers had age <30 years at the time of pregnancy, 13 (32.5%) mother were illiterate, and 10 (25%) mothers had taken less than 4 ANC visits. In 40 nutritionally deficient children, when asked about maternal health status during pregnancy, around 16 (40%) mothers were malnourished. This association between antenatal malnutrition and deficiency disorders in children was statistically significant (p=0.04) (Table 2).

**Table 1: Distribution of 4Ds (N=96).**

| Type of 4 D | Number* | % |
|---|---|---|
| **Birth defects** | 46 | 47.9 |
| **Deficiency disorders** | 39 | 40.6 |
| **Chronic diseases** | 10 | 10.4 |
| **Developmental delays** | 1 | 1.04 |

*Based on primary condition detected, there were cases with multiple Ds

**Table 2: Association between maternal and child factor with deficiency disorders.**

| Maternal and child factor | | Deficiency | No deficiency | Total | P value |
|---|---|---|---|---|---|
| **Age (years) (N=95)** | <30 | 37 | 45 | 82 | 0.1368 |
| | ≥ 30 | 3 | 10 | 13 | not significant |
| **Education level (N=96)** | Illiterate | 13 | 14 | 27 | 0.42 |
| | Literate | 27 | 42 | 69 | not significant |
| **ANC visit (N=90)** | <4 | 10 | 7 | 17 | 0.1 |
| | ≥4 | 27 | 46 | 73 | not significant |
| **Maternal malnutrition (N=94)** | Normal | 23 | 43 | 66 | 0.04 |
| | malnutrition | 16 | 12 | 28 | significant |
| **Birth weight (N=82)** | <2.5 (LBW) | 17 | 12 | 29 | 0.008 |
| | >2.5 | 15 | 38 | 53 | significant |
| **Birth order (N=96)** | <3 | 28 | 47 | 75 | 0.11 |
| | ≥3 | 12 | 9 | 21 | not significant |

**Table 3: Association between maternal/child factors and birth defects (N=95).**

| Maternal and child factor | | Defect (N=46) | No defect (N=49) | Total (N=95) | P value |
|---|---|---|---|---|---|
| **Maternal age (years)** | <30 | 37 | 45 | 82 | 0.108 not significant |
| | ≥30 | 9 | 4 | 13 | |
| **ANC visit** | <4 | 6 | 11 | 17 | 0.21 not significant |
| | ≥4 | 38 | 35 | 73 | |
| **Type of delivery** | Institutional | 46 | 43 | 89 | 0.24 not significant |
| | Others* | 2 | 5 | 7 | |

*Include 6 home and 1 on way

Out of 40 nutritionally deficient children, 17 (42.5%) were born with <2.5 kg birth weight. Low birth weight children are vulnerable to develop nutritional deficiency in later life. This association between birth weight and deficiency disorder is statistically significant (p=0.008). Among deficiency disorder child, 12 (30%) children had birth order ≥3 (Table 2). Major congenital anomalies observed were congenital heart disease (CHD), cleft lip/palate, club foot, congenital deafness and Down's syndrome. Out of 46 children with congenital defect, 9 (19.5%) of mothers had age ≥30 years at the time of pregnancy (Table 3). Minimum 4 recommended ANC visits not taken by 17 (17.7%) and IFA supplementation was not taken by 13 (13.5%). Out of 17 mothers who had not taken minimum 4 recommended ANC visits, 6 (35%) children had congenital defect.

Majority of deliveries were done in institution except 7 deliveries. Adverse events/illnesses during pregnancy (MDR TB, hypertension, gestational diabetes, urinary tract infection, severe oligohydramnios, anemia and hyperpyrexia) were experienced by 15 (15.6%) mothers.

We found 31(32%) children with low birth weight (<2.5 kg). When asked about maternal health status during antenatal period in LBW children, 15 (48%) mothers were malnourished during pregnancy (Table 4). Birth weight of the child and maternal health status during pregnancy was statistically significant (p=0.0046).

**Table 4: Association between nutritional status of mother and birth weight (N=82).**

| Maternal malnutrition | Birth weight (kg) | | | P value |
|---|---|---|---|---|
| | <2.5 (N=31) | ≥2.5 (N=49) | Total (N=82) | |
| **Healthy** | 16 | 40 | 56 | 0.0046 significant |
| **Malnourished** | 15 | 9 | 24 | |

*Some maternal information not obtained because of non-availability of mother, death of mother, care giver unable to recall & non availability of records

## DISCUSSION

Maternal factors associated with outcome of pregnancy were biological, social and medical. Some of them such as age at conception and mother's nutritional status are significantly associated with outcome (defect and deficiency). If these maternal risk factors are detected and managed early, cases with 4 D's can be minimized. Though multiple studies have shown that increase in maternal age is associated with chances of congenital anomalies. But current study did not reflect the same may be due to small sample size. Teenage pregnancy was associated with a higher risk of not only socioeconomic disadvantage but also mental health problems affecting the outcome of pregnancy.[9] Adolescent deliveries carry a higher risk of adverse outcomes due to the immaturity of reproductive organs.[10] It was found that out of 4 teenage mothers, two had children either with nutritional deficiency or had childhood diseases. During the period of pregnancy, minimum 4 ANC visits are required to identify high risk pregnancy and also the early identification of major congenital anomalies. IFA supplementation during the pregnancy not only caters for pre-existing anemia but also addresses the increased demand of micronutrients. Any risk factor if identified and managed during early ANC, can improve the perinatal outcome. However other factors like literacy, occupation, gravida and health seeking behavior can also affect the outcome. Chronic diseases during pregnancy increase the risk of complications such as pre term pregnancy, low birth weight baby and issues with breast feeding.[11] Adverse event or illness during pregnancy was experienced by 15 (15.6%) mothers who might have affected the child health. More than half mother experienced nutritional deficiencies and sought the treatment in form of blood transfusion or intravenous iron sucrose injection later had children with deficiency (SAM, anemia), low birth weight infants. It was observed that the children born with <2500 gm birth weight, around 50% such children suffered with nutritional deficiency later in life. Birth weight of the child was significantly associated with nutritional status of child in later life. In spite of various state specific interventions under five malnutrition (weight for age) has increased from 39.3% to 39.7%.[12] Maternal malnutrition was significantly associated with birth weight (Table 4). Maternal nutrition can improve birth weight and subsequently under-five nutrition.

Due to the logistic constraints, the small sample and inclusion of subjects from a single UHC limit the validity of observations. Finally, the corona pandemic affected our work.

## CONCLUSION

Maternal age at pregnancy, health status of mother, ANC care (number of ANC visits, IFA supplementation), health seeking behavior, birth weight and birth order of child were major determinants of 4 Ds.

### *Recommendations*

To prevent 4 Ds, preventable maternal factors like early age (teenage pregnancy in slums) or very advance age of pregnancy needs to be addressed through sex education and knowledge regarding physiology of pregnancy; can be given to girl child in the school. Proper counselling about genetic diseases and problems of elderly gravida should be discussed during Antenatal visits. ANC care including antenatal examination, IFA and calcium supplementation, ultrasound examination etc., birth weight and birth order were other key factors which influences the child health later in life. Treatment and health seeking behavior in general and under RBSK in particular along with proper diet during pregnancy can minimize the risk of LBW and SAM children later in life.[13] Nutrition status during pregnancy has a major impact on outcome of pregnancy, so nutritional counselling should be the part of comprehensive antenatal care.

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## REFERENCES

1. Procter SB, Campbell CG. Position of the Academy of Nutrition and Dietetics: nutrition and lifestyle for a healthy pregnancy outcome. J Acad Nutr Diet. 2014;114(7):1099-1032.
2. Mate A, Reyes-Goya C, Santana-Garrido Á, Vázquez CM. Lifestyle, Maternal Nutrition and Healthy Pregnancy. Curr Vasc Pharmacol. 2021;19(2):132-40.
3. Ramakrishnan U, Grant F, Goldenberg T, Zongrone A, Martorell R. Effect of women's nutrition before and during early pregnancy on maternal and infant outcomes: a systematic review. Paediatr Perinat Epidemiol. 2012;26(1):285-301.
4. Suárez-Idueta L, Bedford H, Ohuma EO, Cortina-Borja M. Maternal risk factors for small-for-gestational-age newborns in Mexico: analysis of a nationwide representative cohort. Front Public Health. 2021;9.
5. Khalil A, Syngelaki A, Maiz N, Zinevich Y, Nicolaides KH. Maternal age and adverse pregnancy outcome: a cohort study. Ultrasound Obstet Gynecol. 2013;42(6):634-43.
6. Wu Y, Chen Y, Shen M, Guo Y, Wen SW, Lanes A, et al. Adverse maternal and neonatal outcomes among singleton pregnancies in women of very advanced maternal age: a retrospective cohort study. BMC Pregnancy Childbirth. 2019;19(1):3.
7. Harris BS, Bishop KC, Kemeny HR, Walker JS, Rhee E, Kuller JA. Risk factors for birth defects. Obstet Gynecol Surv. 2017;72(2):123-35.
8. Rashtriya Bal Swasthya Karyakram (RBSK), operational Guidelines. Ministry of Health and Family Welfare Government of India. Feb 2013. Available at: https://cghealth.nic.in/nhmcg/Informations/RMNCH/7Rastriya_Bal_Swaasthya_karyakaram.pdf. Accessed on 20 June 2022.
9. Wong SPW, Twynstra J, Gilliland JA, Cook JL, Seabrook JA. Risk factors and birth outcomes associated with teenage pregnancy: a Canadian sample. J Pediatr Adolesc Gynecol. 2020;33(2):153-9.
10. Njim T, Tanyitiku BS, Babila CS. Prevalence of adolescent deliveries and its complications in Cameroon: a systematic review and meta-analysis. Arch Public Health 2020;78(24).
11. U.S. National Library of Medicine Clinicaltrials.gov. Pregnancy and chronic disease: The effect of a midwife- coordinated maternity care intervention. Available at: https://clinicaltrials.gov/ct2/show/NCT03511508. Accessed on 20 June 2022
12. National Family Health Survey- 5. State fact sheet Gujarat. Available at: https://www.im4change.org/docs/Gujarat%20NFHS-5%20Factsheet.pdf. Accessed on 20 June 2022.
13. Bhatt G, Sharma R, Bakshi H, Oza D, Dave R, Pirzada A. A retrospective cohort study on utilization of Rashtriya Bal Swasthya Karyakram (RBSK) services among children screened at an urban health centre (UHC) of Ahmedabad Municipal Corporation (AMC). Healthline. 2022;13(3):228-32.

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