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Highlights

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Dietary Patterns in Pregnant Adolescents

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Abstract- Introduction: Adolescence and pregnancy increase nutritional needs. Pregnant adolescents have higher energy requirements to maintain maternal health and ensure adequate fetal growth and development.

Aim: Identify patterns of diet consumption among Pregnant adolescents.

Methods: We carried out a cross-sectional study between November 2014 and July 2016 among teenage mothers. Food intake was analyzed using asemiquantitative food frequency questionnaire (FFQ). We identified the food patterns as *a posteriori* using cluster analysis.

Results: 294 adolescents participated in the study. The mean age was 17.83 ± 1.29 years. Sixty-five percent of participants self-declared as Caucasian and 83.3% were primiparous. Pre-gestational BMI was 23.71 ± 5.04 kg/m², and 42.9% of the sample showed excessive weight gain during pregnancy.

Keywords: dietary pattern, pregnant women, adolescent pregnancy, cluster analysis.

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Dietary Patterns in Pregnant Adolescents

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Conclusion: The study confirmed that pregnant teenagers tend to adopt the food pattern Junk Food, regardless of sociodemographic aspects.

Keywords: dietary pattern, pregnant women, adolescent pregnancy, cluster analysis.

I. INTRODUCTION

In Brazil, about 17.5% of births are from adolescent mothers. (1, 2, 3) Several transformations take place in adolescence, a time when external factors may have a greater influence on food behavior. Besides familial eating habits, friends' habits, and sociocultural values and rules, the media and trends surrounding teenagers are also factors that affect food choices (4). Compared to other life stages, adolescents have energy needs, macro and micronutrients increased, including calcium, iron, and zinc (5). Therefore, adolescent pregnant women have higher nutritional requirements to maintain maternal health and ensure adequate fetal growth and development (6).

Nutrition has a strong influence on maternal and fetal health during pregnancy, but we did not find studies that specifically address dietary patterns in pregnant adolescents. Adolescent nutritional habits become a center of concern when malnourished teens become pregnant. Thus, the analysis of dietary patterns can be useful for the measurement of individual nutrients in studies. Nutritional condition is one of the most important and modifiable factors affecting the health of the pregnant adolescent and the fetus. We aimed to identify the dietary patterns among pregnant adolescents in southern Brazil.

II. METHODS

Between July 2014 and July 2016, we conducted a cross-sectional study among postpartum adolescents (≥ 10 years and ≤ 20 years) in a university hospital in southern Brazil. We excluded those with a gestational age <20 weeks or who were unable to answer the questionnaires. After analysis of food intake, women who consumed less than 600 kcal/day or more than 6000 kcal/day were also excluded, as per the research by Leal and Santos (7, 8). The final sample consisted of 294 subjects.

We collected data at the obstetric hospital unit after informed consent. We applied a questionnaire on sociodemographic and nutritional variables and reviewed their obstetrical data. Ethics and Research Committee of Hospital de Clínicas de Porto Alegre approved the project (number 140491; protocol no. at PlataformaBrasil35265514.3.0000.5327).

The analysis included: household income (defined as the number of minimum wages earned by a

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family); marital status; self-declared race; educational attainment; self-declared pre-gestational weight; measured height and pre-gestational BMI; weight gain during pregnancy (calculated by the difference between the last measured weight and the declared weight at the beginning of pregnancy); and gestational age at delivery, according to the method employed by Capurro (9). The pre-gestational nutritional status was established by calculating the Body Mass Index for Age (BMI/A) and analyzing the Z-score. Subjects were classified as low weight ($Z < -2$ SD), eutrophic (-2 SD $\leq Z \leq +1$ SD), overweight ($+1$ SD $< Z \leq +2$ SD), or obese ($Z > +2$ SD) (10). We determined the weight adequacy ranges for full-term pregnant women $\nless 37$ weeks), which were equivalent to 12.5 to 18 kg for women with low pre-gestational weight; 11.5 to 16 kg for eutrophic women; 7 to 11.5 kg for overweight women; and 5 to 9.1 kg for obese women (11).

We assessed the usual intake patterns throughout the whole pregnancy period. Asemiquantitative food frequency questionnaire (FFQ) developed and validated for use with pregnant women (12) and adapted to the studied population was used for analyzes food intake. The intake frequency options were converted into daily intake values: "more than three times/day" = 3; "two to three times/day" = 2; "once a day" = 1; "five to six times/week" = 0.79; "two to four times/week" = 0.43; "once a week" = 0.14; "one to three times/month" = 0.07; "never or almost never" = 0. We extracted nutritional information on the composition of foods from the National Nutrient Database (13) and searched in the Brazilian Table of Food Composition (14) data for items that were not present in the National Nutrient Database. The 88 FFQ items were pooled into 29 groups according to similarities in nutritional content or botanical composition, as described in Table 1(15). Food items mentioned by more than 80% of the sample and not previously included in the list were also added to the analysis, totaling 91 items. We converted the intake of each group into a percentage of the daily caloric intake (16).

We exclude seven foods/groups (whole grains, cassava flour, whole wheat bread, butter, fresh fish, canned fish, and alcoholic beverages) due to being consumed by less than 20% of the study population, which resulted in a final total of 22 groups. The exclusion prevented the formation of groups of "nonconsumers" that could mischaracterize the identified food patterns (17). We calculated median and interquartile ranges for each of the food groups that remained in the study (18) and compared then using the Mann-Whitney U test for independent samples.

We used cluster analysis based on the food groups to identify dietary patterns and then derived two non-overlapping groups (food standards) using the κ -means method. We used pattern names similar or equal

to the ones found in studies carried out with the same methodology (19, 20, 21, 22).

As described in the literature, a minimum of five subjects is required for each food or food group to constitute a food pattern (22), with ten or more being ideal. In this study, there were 13.4 subjects per group.

We used SPSS software version 18.0 for performed statistical analysis. For expressed categorical variables we used absolute (n) and relative (%) frequencies. Continuous variables were expressed as mean and standard deviations (\pm SD) in normal distributions or as median and interquartile ranges (P25 - P75) in asymmetrical distributions. The level of significance was 5% ($p \leq 0.05$; 95% confidence interval (CI). Shapiro-Wilk test was used for test normality in all analyzed variables. We used the chi-squared test with adjusted residual analysis, Student's t-test, and the Mann-Whitney U test for independent samples to analyze the associations between dietary patterns according to the type and distribution of variables and number of categories (23).

III. RESULTS

The sample consisted of 294 postpartum adolescents. They were grouped into two clusters, referred to as "Traditional Diet" and "Junk Food." The mean age was 17.83 ± 1.29 years, with no difference between clusters: 17.83 ± 1.20 years for the Traditional Diet and 17.77 ± 1.35 years for Junk Food ($p = 0.759$). Of the total subjects, 65% were self-declared Caucasians. In the Traditional Diet group, 63.1% of subjects were self-declared Caucasians, compared to 66% in Junk Food ($p = 0.624$). The mean number of years of study was 9.04 ± 2.17 for the whole sample, 9.11 ± 2.14 years for the Traditional Diet group, and $9.33 \pm 2, 00$ years for the Junk Food group ($p = 0.303$). Most of the sample consisted of single unmarried subjects (83.6%), with a similar percentage for both groups (Traditional Diet: 82.5%; Junk Food: 84.1%). Household income was between 1.5 and 3 minimum wages for 62% of the total sample, with similar values for both groups (Traditional Diet: 61%; Junk Food: 62.6%) ($p = 0.800$).

Primiparous adolescents comprised 83.3% of the total sample. The mean pre-gestational BMI was 23.71 ± 5.04 kg / m². 67% of subjects in the Traditional Diet cluster and 62.3% in Junk Food were eutrophic ($p = 0.687$). Excessive weight gain during pregnancy occurred in 42.9% of pregnant women, totaling 37.5% in the Traditional Diet pattern and 45.8% in Junk Food ($p = 0.068$). Table 2 shows the sociodemographic and anthropometric details of the sample.

We used cluster analysis to identify the patterns and quality of the food consumed. The first cluster referred to as "Traditional Diet" food standard (n = 103), presented a higher intake of traditional Brazilian food

items, i.e., rice and beans ($p < 0.001$). The second cluster, referred as “Junk Food” food standard ($n = 191$), was characterized by a higher intake of meat ($p =$

0.006), snacks ($p = 0.019$), chips ($p = 0.035$), candies, and soft drinks ($p < 0.001$). Figure 1 shows the food groups most consumed in each group.

Traditional	Junk food
Refined cereals white rice and pasta, cooked cornmeal	Meats beef, pork, organ meat, chicken
Legumes beans, lentils, peas, chickpeas	Snacks pizza, snacks such as kibbeh, pastries
	Chips chips, french fries
	Candies ice cream, sugar, candy, chocolate powder, chocolate bars/bonbons, pudding, dulce de leche, sweetened condensed milk
	Soft drink light or regular soft drink, artificial powdered juice

Figure 1: Food groups most consumed according to dietary patterns.

In the Traditional Diet pattern, legumes accounted for 20.85% of the total energy intake, while refined cereals accounted for 11.4%. In Junk Food, chips (2.57%), sweets (9.59%), and soft drinks (10.37%), when combined with snack consumption (1.69%), accounted for 24.22% of the total energy value (TEV) consumed. White bread intake was also higher in Junk Food (12.62%) than in the Traditional Diet (9.77%), but with a marginal statistical difference ($p = 0.059$) between groups.

Intake of foods classified as vegetables (leafy vegetables and other vegetables), dairy products (milk, yogurt, and cheese), and fruit did not differ significantly between groups. For leafy vegetables $p = 0.238$, for other vegetables $p = 0.895$; for milk $p = 0.796$, for yogurt $p = 0.277$, for fruit $p = 0.986$ and $p = 0.372$ for cheese. Vegetables, including leafy vegetables and other types, accounted for less than 1% of the TEV consumed for both groups (Traditional Diet: 0.65%; Junk Food: 0.61%). These findings are in Table 3.

We found no significant associations between eating patterns and pre-gestational BMI/socio-demographic variables, were identify (Pearson's χ^2 test): age ($p = 0.759$), educational attainment ($p = 0.303$). With Mann-Whitney U test: color ($p = 0.624$), marital status ($p = 0.923$), household income ($p = 0.800$), and

pre-gestational BMI ($p = 0.687$). There was a marginally-significant association between adequacy of gestational weight gain and the Traditional Diet pattern ($p = 0.068$).

Adolescents in the Traditional Diet cluster had a significantly higher intake of protein (in grams, $p = 0.03$; in %TEV, $p < 0.001$), magnesium, folate, iron ($p \leq 0.0001$), and potassium ($p = 0.005$). Meanwhile, adolescents in the Junk Food cluster consumed greater total fat in grams and %TEV ($p < 0.001$) and a higher amount of saturated fat and cholesterol in grams ($p < 0.001$), with a marginal significance for higher caloric intake ($p = 0.066$). Carbohydrate intake in grams and %TEV did not differ between clusters ($p = 0.170$ and $p = 0.399$).

The mean value of sodium consumption was 4551.42mg for the Traditional Diet and 4294.64mg for Junk Food, with no significant difference between groups ($p = 0.087$). Calcium intake was 1235.23mg for the Traditional Diet cluster and 1297.03mg for Junk Food ($p = 0.407$). Table 4 described each group distribution of macro- and micronutrient consumption.

IV. DISCUSSION

Adolescence is a transitional period and subject to external influences, which modifies eating habits. We

identified two dietary patterns: Traditional Diet and Junk Food. The Junk Food pattern was characterized by a higher intake of easily-accessible, ready-made food items widely advertised in the media: snacks, chips, sweets, and soft drinks. Previous studies with non-pregnant adolescents (22, 23, 24, 25) also had seen these data, which suggests that this age group tends to increased consumption of foods considered unhealthy. In the present study, where the Junk Food cluster grouped 65% of the sample, the intake pattern was the same as the one adopted by non-pregnant adolescents. This suggests that junk food group tends to keep the same dietary pattern during pregnancy, a fact that may be related to the characteristics of adolescence. Conversely, a study carried out among adult pregnant women found a change in intake patterns, with a reduction in the intake of ultra-processed foods and a slight increase in the consumption of *in nature*/minimally-processed foods (26).

In our study, only 35% of subjects adhere to the Traditional Diet pattern, characterized by higher consumption of the standard Brazilian foods, i.e., rice or pasta and beans for the main meals (lunch and dinner). Weight gain during pregnancy was more healthy for pregnant women who followed this pattern. Previous findings showed that eutrophic adolescents followed a diet based on the traditional Brazilian standard (20, 27, 28), and a study carried out by Sichieri (20) revealed that adherence to this standard in adults was a protective factor against overweight. Encouraging the intake of foods belonging to the Brazilian dietary pattern would be an great measure to prevent obesity and excess weight gain among pregnant Brazilian adolescents.

We identified a higher caloric intake in the group Junk Food, which is consistent with other studies among non-pregnant adolescents (29, 30, 31). The "soft drinks" and "candies" food groups contributed the most to caloric intake in this dietary pattern. According to a systematic review carried out by Trumbo in the United States, sweetened drinks, one of the major contributors to the high caloric intake of the American population (32), are associated with lower consumption of water, milk, fruits, and vegetables and higher consumption of ultra-processed foods. These eating habits are related to an increased risk of adverse health consequences, such as micronutrient deficits, weight gain, diabetes, and hypertension (33). The pregnant adolescents in this study who consumed more sugars from candies and sweetened drinks showed bigger weight gain during pregnancy, with 19.96% of their caloric intake coming from these food groups.

Meat consumption was higher in the Junk Food pattern, a factor that may have contributed to the higher intake of fats and cholesterol observed in this cluster. However, traditional diet group had higher protein intake. In a Portuguese cohort (34) study with 7591 adults, unhealthy eating patterns characterized by a

lower intake of vegetables, fresh fruit, fish, dairy products, and water associated with high meat consumption. Gregório *et al.* found an independent association between younger individuals and higher meat consumption. This is consistent with our results, which showed a repetition of this dietary pattern among young individuals, regardless of gestation status.

The intake of magnesium, potassium, and folate was higher in the Traditional Diet pattern, but the levels were within the recommended amounts for the entire sample. Iron intake was also higher in the Traditional Diet pattern, but iron levels were lower than the recommended in both clusters. Previous studies on inadequate iron intake in adolescence, particularly in females (8, 35) and in adult pregnant women (36), have pointed to the adverse effects caused by iron deficiency in both adolescence and pregnancy. The findings reinforce the need to encouraging this population to seek adequate iron intake through food sources and supplements, especially during pregnancy.

In our study, calcium intake was closer to the recommended amounts for adolescent pregnant women, with lower average consumption in the Junk Food standard (95% adequacy). Previous studies have also identified a deficit in calcium intake, mainly in adolescents (8, 35). Inadequate calcium intake might put this population at risk for calcium deficiency as adolescence is the period of peak bone mass acquisition. Additionally, deficient calcium intake may affect fetal bone formation.

We also identified an excess sodium intake, which figured at almost twice the maximum recommended amounts according to Veiga *et al.* (35). This finding points to the need to increase awareness in the adolescent population, especially in pregnant teenagers, about the risks and adverse health effects of excessive sodium intake, both during pregnancy and in the long term.

Excessive weight gain during pregnancy occurred in 42.9% of our sample. According to Kac *et al.* (37), delivering the first child before the age of 23 and having a gestational weight gain over 12 kg are predictors associated with maintenance of weight gain. Additionally, excess weight gain during pregnancy may lead to the retention of postpartum weight (38). Gigante *et al.* (39) showed that adolescents who had been pregnant at least once had a higher BMI compared to nulliparous adolescents. These factors may contribute to the high rate of obesity found in young Brazilian women. Other studies are needed to verify the association between excess weight gain during pregnancy in adolescence and obesity in adulthood within this specific group.

According to Brazilian population data, overweight in adolescent girls increased significantly from 2008 (23.4%) to 2015 (31.1%) (IBGE 2008-09; IBGE 2015). The study by Fonseca *et al.* (40), which

assessed 712 pregnant women, found that 34.7% of them were overweight at the beginning of gestation and 36.9% had excessive gestational weight gain. Similarly, we classified 34.6% of adolescents in our study as pre-gestational overweight, and 42.9% showed excess weight gain during pregnancy. In addition to being a public health problem, obesity and overweight in adolescence are risk factors for cardiovascular diseases and diabetes (41).

This study has a few limitations. The sample collected, due to comprising a very restricted population, was not enough to demonstrate significant differences associated with socio-demographic aspects between groups. Besides, feeding studies that use food surveys are susceptible to bias, as they rely on the

respondents' memory, understanding of the tools, and the skill of the interviewers. The FFQ used was validated for pregnant women; however, our sample was composed just of pregnant adolescents, and we did not find references to this population in the validated FFQ literature. Further studies with similar sample characteristics are needed to compare the dietary profiles of different groups of pregnant women.

We conclude that adolescent pregnant women have, for the most part, an unhealthy diet pattern. These findings may serve as an incentive to improve eating patterns in this population, as the current one is associated with obesity and other chronic non-communicable diseases in the long term.

Table 1: Classification of food groups consumed by pregnant adolescents based on nutritional content and botanical composition.

Food or food groups		Group composition
1.	Refined cereals	White rice and pasta, cooked cornmeal
2.	Whole cereals [#]	Brown rice and whole pasta
3.	Legumes	Beans, lentils, peas, chickpeas
4.	Cassava flour [#]	Cassava flour
5.	White bread	French bread and sliced bread, homemade bread
6.	Whole bread [#]	Whole wheat and rye bread
7.	Cookies	Cookies, crackers, cake
8.	Potato/cassava	Cooked potato, cassava
9.	Popcorn	Popcorn
10.	Leafy vegetables	Leafy vegetables (lettuce, chicory, collard greens, and cabbage)
11.	Fruit	Fruit and natural juice
12.	Onion/garlic	Onion/garlic
13.	Other vegetables	Non-leafy vegetables (including corn in the cob, excluding garlic and onion)
14.	Eggs	Eggs
15.	Milk	Whole, semi-skimmed and skimmed milk
16.	Yogurt	Plain and light yogurt
17.	Cheese	Cheese
18.	Creamy cheese/margarine/mayonnaise	Creamy cheese/margarine/mayonnaise (ultraprocessed, similar form of consumption)
19.	Butter	Butter
20.	Meat	Meat (beef, pork, organ meat, chicken)
21.	Sausages	Sausages and processed meats (ham*/mortadella*, sausages, hamburguers, bacon/lard)
22.	Fresh fish [#]	Fresh fish, shrimp
23.	Canned fish [#]	Canned tuna and sardines
24.	Snacks	Pizza, snacks such as kibbeh, pastries
25.	Chips	Chips, french fries
26.	Candies	Ice cream, sugar, candy, chocolate powder, chocolate bars/bonbons, pudding, dulce de leche, sweetened condensed milk*)
27.	Soft drink	Light or regular soft drink, artificial powdered juice
28.	Coffee [#]	Coffee
29.	Alcoholic beverages [#]	Alcoholic beverages (wine, beer and other alcoholic beverages)

Table 2: Sociodemographic and anthropometric characteristics of the pregnant adolescents.

Characteristics	Dietary pattern			p value *
	Total sample	Traditional (n=103)	Snacks and candies (n=191)	
Age (n=294)	17.83 ± 1.29	17.83 ± 1.20	17.77 ± 1.35	0.759 ^a
Race (n=294)				
White	191 (65.0)	65 (63.1)	126 (66.0)	0.624 ^b
Nonwhite	103 (35.0)	38 (36.9)	65 (34.0)	
Year of study (n=294)	9.04 ± 2.17	9.11 ± 2.14	9.33 ± 2.00	0.303 ^a
Marital status (n=292)				
Single without partner	244 (83.6)	85 (82.5)	159 (84.1)	0.923 ^b
Single with partner	38 (13.0)	14 (13.6)	24 (12.7)	
Married	10 (3.4)	4 (3.9)	6 (3.2)	
Family income (minimum wage) (n=245)				
< 1,5	63 (25.7)	23 (28)	40 (24.5)	0.800 ^b
1,5 a 3	152 (62.0)	50 (61)	102 (62.6)	
> 3	30 (12.2)	9 (11)	21 (12.9)	
Pre-gestational BMI (n=280)	23.71 ± 5.04			
Underweight	4 (1.4)	2 (2.1)	2 (1.1)	0.687 ^b
Eutrophy	179 (63.9)	65 (67)	114 (62.3)	
Overweight	58 (20.7)	19 (19.6)	39 (21.3)	
Obesity	39 (13.9)	11 (11.3)	28 (15.3)	
Adequacy of gestational weight gain (n=275)				
Insufficient	75 (27.3)	23 (24)	52 (29.1)	0.068 ^b
Adequate	82 (29.8)	37 (38.5)	45 (25.1)	
Excessive	118 (42.9)	36 (37.5)	82 (45.8)	

BMI: body mass index

* Significance: $p \leq 0.05$ ^a Mann Whitney U test.^b Pearson's chi squared test

Table 3: Description of dietary patterns in pregnant adolescents according to the %VET of each food/food group.

Foods/groups	Traditional (n=103)	Snacks and candies (n=191)	p-value *
Refined cereals	11.4 [7.75 – 14.72] ¹	8.6 [9.1 – 10.7]	≤0.0001
Legumes	20.85 [17.73 – 25.96] ¹	5.46 [2.76 – 9.69]	≤0.0001
White bread	9.77 [5.14 – 17.21]	12.62 [5.61 – 20.23]	0.059
Cookies	3.15 [0.95 – 6.58]	4.66 [1.98 – 8.23]	0.051
Potato/cassava	0.51 [0.00 – 1.22]	0.52 [0.00 – 1.43]	0.895
Popcorn	0.00 [0.00 – 0.21]	0.00 [0.00 – 0.19]	0.924
Leafy vegetables	0.07 [0.02 – 0.18]	0.06 [0.16 – 0.14]	0.238
Fruit	3.92 [2.30 – 8.23]	4.37 [2.00 – 8.82]	0.986
Onion/garlic	0.31 [0.18 – 0.44]	0.29 [0.17 – 0.38]	0.183
Other vegetables	0.58 [0.26 – 0.48]	0.55 [0.24 – 1.38]	0.895
Eggs	0.29 [0.00 – 0.74]	0.35 [0.10 – 1.00]	0.286
Milk	4.71 [1.43 – 9.78]	4.96 [1.72 – 8.93]	0.796
Yogurt	0.64 [0.00 – 2.39]	0.43 [0.00 – 2.25]	0.277
Cheese	0.25 [0.00 – 1.25]	0.46 [0.00 – 1.59]	0.372
Creamy cheese/margarine/mayonnaise	0.78 [0.33 – 1.34]	0.87 [0.43 – 1.61]	0.227
Meat	7.81 [4.38 – 10.41]	8.51 [6.01 – 13.65] ¹	0.006
Sausages	1.15 [0.59 – 1.96]	1.33 [0.61 – 2.25]	0.359
Snacks	1.37 [0.28 – 2.70]	1.69 [0.61 – 3.77] ¹	0.019
Chips	1.79 [0.78 – 4.03]	2.57 [0.90 – 6.39] ¹	0.035
Candies	5.87 [3.62 – 9.23]	9.59 [5.97 – 14.96] ¹	≤0.0001
Soft drink	6.29 [3.23 – 9.77]	10.37 [5.34 – 17.09] ¹	≤0.0001

%TEV: percentage of total energy value.

* Mann-Whitney U test for p. Significance: ≤ 0.05.

¹ Food / food groups with a higher consumption.

Not presented: food / food groups that were consumed by less than 20% of the sample.

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Contributor statement

JV, EGV, RCS, and VLB conceived/designed the study and worked on data collection. CA and MV worked on data collection. MLOR, JV, VLB, and RCS carried out the initial analyses, drafted the initial manuscript, and critically reviewed and revised the manuscript. Amanda VP write and correct the article. Aline VP translate for English. All authors read and approved the final manuscript as submitted.

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Variations in Gestational Anthropometric Parameters of Pregnant Subjects and their Predictive Values of the Birth Weight of the Neonate

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Abstract- Background: Birth weight is an important determinant of an infant's well-being as low or large birth weight are associated with morbidities or mortality during pregnancy and later in life. Maternal anthropometry is a potential veritable tool in evaluation of pregnancy status and prediction of birth weight.

Aim: This study was designed to determine the predictive values of the gestational variations of some anthropometric parameters in booked pregnant subjects at the antenatal clinic of Alex Ekwueme Federal University Teaching Hospital, Abakaliki and in which trimester these anthropometric parameters (weight, height, BMI, BSA) correlates better with the birth weight of a neonate.

Keywords: body mass index, body surface area, weight, height, neonatal birth weight.

GJMR-E Classification: NLMC Code: WS 420



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Subjects and methods: In this cross-sectional study, six hundred and thirty five (635) pregnant subjects attending antenatal care at the Alex Ekwueme Federal University Teaching Hospital were recruited and followed up through pregnancy till delivery. Weight and height were measured at booking and weight repeated at each visit. Values obtained from the above measurements were then inserted into appropriate formulae to calculate the body mass index and body surface area. A mini-questionnaire was used to extract information such as age and parity. Variables were coded and analysed with SPSS version 20. Data were presented as percentages and tables. The level of statistical significance was set at 0.05 (providing 95% confidence interval). Associations between variables were tested using linear regression models. A receiver operating characteristic curve was used to determine the sensitivity and specificity of the anthropometric parameters in predicting the birth weight (low birth weight- <2.5 kilogrammes or macrosomia- \geq 4 kilogrammes).

Results: The mean age of participants was 29 ± 6.6 years. The mean parity was 2.3. The mean weight of all participants in the first, second and third trimesters were 70.6 ± 11.2 kilograms, 77 ± 6.7 kilograms and 77.3 ± 13.9 kilograms respectively. The mean height of respondents was 1.63 ± 0.13 meters. The mean first, second and third trimester BMIs were 27.2 ± 3.2 , 27.9 ± 4.5 and 29.8 ± 4.2 respectively. The mean birth weight of babies was 3.3 ± 0.46 kilograms. The mean first, second and third trimester body surface area were 1.71 ± 0.254 , 1.80 ± 0.167 and 1.87 ± 0.157 respectively.

53.2% of babies born were females. Linear regression analysis showed there was a positive correlation

between first, second and third trimester BMI and birth weight, which was not statistically significant for the first and third trimesters but statistically significant for second trimester ($r = 0.017$, $p = 0.037$). There was also a positive correlation between parity and birth weight which became statistically significant with increasing parity ($r_0 = 0.145$, $p_0 = 0.875$ and $r_5 = 0.204$ and $p_5 = 0.017$).

Body surface area (BSA) also showed statistically significant correlation with the birth weight of the neonate in the first, second and third trimesters ($r = 0.56$, $p = 0.0098$, $r = 0.58$, $p = 0.0076$ and $r = 0.611$, $p = 0.0086$). Its correlation was stronger than that of body mass index. Maternal height and weight did not show statistically significant correlation with the birth weight of the baby. BMI had a sensitivity of 73% and specificity of 31% in determining if a baby would be macrosomic (birth weight greater than or equals 4 kilograms) or low birth weight (weight less than 2.5 kilogrammes) while BSA had a sensitivity of 84% and specificity of 65% in predicting same.

Conclusion: From the study it can be concluded that determinants of birth weight are multifactorial. Mid-trimester body mass index and body surface areas in the three trimesters with their inexpensive ways can offer hope as predictors of birth weight of the neonate, with BSA showing more sensitivity and specificity than BMI. More studies are needed especially for BSA to validate or refute the foregoing.

Keywords: body mass index, body surface area, weight, height, neonatal birth weight.

1. INTRODUCTION

Anthropometry is the systematic collection and correlation of measurements of the human body. It is one of the principal techniques of physical anthropology¹. It originated in the 19th century, when early studies of human biological and cultural evolution stimulated an interest in the systematic description of populations both living and extinct¹. In the latter part of the 19th century, anthropometric data were applied, often subjectively, by social scientists attempting to support theories associating biological race with levels of cultural and intellectual development¹.

The body mass index also known as Quetelet index, is proxy for estimating human body fat based on an individual's weight and height². It is defined as the individual's body mass divided by the square of his or her height. The formula universally used is in a unit of kg/m^2 (height measured in meters and weight measured

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in kilograms). The WHO categorized BMI to assess how much an individual's body weight departs from what is normal or desirable for his or her height. The WHO categorization is the most popular and is as follows²: Underweight (<18.5), normal (18.5 to 24.99), overweight (25 to 29.99), obesity class 1(30 to 34.99), Obesity class 11(35 to 39.99) and obesity class 111(40 and above). BMI has not been vastly used in estimating foetal weight but in Obstetrics, a pregnant woman's weight is an extremely important factor in the course of pregnancy as not only obesity but being underweight may lead to complications in pregnancy such as preterm delivery and low neonatal birth weight³. In recent years, infant birth weight has been increasing in many countries, representing an Obstetric hazard and a potential public health problem. Infant survival and birth weight are dependent on the health of the mother during pregnancy so also maternal weight gain as relates BMI, a good predictor of infant birth weight (Shrestha I & Sunuwar L, 2010). Some of the limitations of BMI include its inexactness of the distribution between lean mass and adipose tissue due to its dependence only weight and height. Body surface area (BSA) on the other hand is the measured or calculated surface area of a human body. For many clinical purposes BSA is a better indicator of metabolic mass than body weight because it is less affected by abnormal adipose mass. Estimation of BSA is simpler than many measures of volume². BSA is calculated as follows: $BSA = \sqrt{W \times H/60}$ if H is in centimetres or $BSA = \sqrt{W \times Ht/6}$. The average BSA for men is 1.91 m² and for women was 1.6 m². However, there is some evidence that BSA values are less accurate at extremes of height and weight, where it may be a better estimate. The normal ranges of average body surface area of the population (WHO, 2014): neonate (0.25 m²), children 2 years (0.5 m²), and children 9 years (1.07 m²). Values for adult male and female respectively are: 1.9 m² and 1.6 m² respectively.

Infant birth weight has been increasing in recent times with the risk of obesity later in life⁵. Birth weight is an important determinant of infant's well-being and as such its prediction will aid in reducing the risks associated with obesity⁴. Maternal anthropometry is a potential veritable tool in evaluation of pregnancy status and prediction of foetal weight⁵. Policy makers need evidence about the state of maternal and child health to make the practice of Obstetrics safer, as facilities for prediction and estimation of birth weight of the newborn during pregnancy are not readily available in our environment. Identification of reliable anthropometric parameters for the estimation and prediction of the birth weight of the newborn will bridge this gap and make practice safer.

II. SUBJECTS AND METHODS

Between 14th January, 2017 and 13th October, 2017, we conducted a prospective cohort study of 700 pregnant subjects at the antenatal clinic of Alex Ekwueme Federal University Teaching Hospital, Abakaliki. Out of this number 65 were lost to follow up, with 635 being followed up till delivery. Alex Ekwueme Federal University Teaching Hospital is located in the heart of Abakaliki which is the capital of Ebonyi State, South east Nigeria. It offers specialized Medical care to people resident in Ebonyi and neighbouring states of Benue, Cross River and Enugu. The Antenatal clinic is run by Consultant Obstetricians from the department of Obstetrics and Gynaecology. There are five teams of doctors led by the Consultant who take care of pregnant women at the clinic, in addition to Midwives and other support staff. The clinic runs Mondays through Fridays. During the year prior to commencement of this study, there were 10,651 pregnant subjects who registered for antenatal care at the centre. All consenting pregnant subjects who booked in the first trimester were recruited and followed up till delivery. Unbooked subjects and those with medical illnesses like diabetes, hypertensive disorders of pregnancy and HIV that complicate pregnancy and affect birth weight were excluded from the study. Subjects with twin gestation and those with physical deformities were also excluded from the study. Subjects were recruited from the antenatal clinic after approval was obtained from the ethical committee of the institution. The research topic, procedure and benefits were thoroughly explained to them. The pregnant subjects were recruited at the waiting area of the Antenatal clinic using a systematic random sampling technique where the 3rd seated pregnant subject was recruited after randomly selecting a starting point. The weight and height measurements of recruited subjects were made by the use of a standard and functional stadiometer. Two assistants were recruited and all procedures as regards measurements were explained to them to maintain quality assurance. The body surface area was calculated with the weight and height measurement for each trimester, using the formula $\sqrt{\text{height in centimetres} \times \text{weight in kilograms} / 3600}$. The body mass index was calculated using the formula: weight in kilograms divided by the square of height in metres. A mini questionnaire was also structured to collect information that included the responder's age, parity, weight at each visit, height and birth weight of the baby at delivery. The pregnant subjects were weighed with minimal clothing and with shoes removed. The measurements were made to the nearest 0.1kg by the use of a standard Secastadiometer^R. The scale was ensured to be at the zero mark. The patient was made to stand at the centre of the scale without support, with weight evenly distributed on both feet. The process was repeated as

above. If the measurements differed by 0.4kg, then another measurement was made. If two measurements were taken then, the average value was recorded while the median value was recorded if three measurements were taken.

For height, the stretch stature method was used. The stature is the maximum distance from the floor to the vertex of the skull (the highest point on the skull when the head is in the Frankfort plane). The shoes were also removed while the patient was asked to stand with the back, buttocks and heels against the stadiometer. The patient's feet were placed flat and together on the floor. The patient's head was placed in the Frankfort's position. The patient was instructed to take and hold a deep breath while maintaining the position above. The head board was placed firmly on the vertex, crushing the hair as much as possible. The measurement was then taken to the nearest 0.1 cm at the end of the subject's deep breath. The steps taken above were repeated again. If two measurements differ by more than 0.4cm, a third measurement was taken. If two measurements were taken, the average value was recorded. If three, the median value was recorded

III. RESULTS

A total of 635 subjects were enrolled into the study and followed through antenatal care and delivery. Most (58.1%) of the participants belonged to the age group 25-29 while expectedly the age group 15-19 and 40-44 had the least number each (2%). The mean age of patients was 29 ± 6.6 years while the mean parity was 2.3.

The mean weight in the first trimester was 70.6 ± 11.2 kilograms, mean weight for the second trimester was 77 ± 8.9 kilograms for all subjects while that for the third trimester was 77.3 ± 13.9 . The mean height was 1.63 ± 0.15 metres. The mean first trimester BMI was 27.2 ± 3.2 , mean second trimester BMI was for participants was 27.9 ± 4.5 while that for third trimester was 29.8 ± 4.2 . Of the babies born, 338 (53.2%) were females while the males were 297 (46.8%). The mean birth weight was 3.3 ± 0.46 kilograms. The mean first, second third trimester body surface area were 1.71 ± 0.254 , 1.80 ± 0.167 and 1.87 ± 0.157 respectively.

The socio-demographic characteristics of participants are presented in the frequency tables below.

Table 1: Showing the frequency distribution of sociodemographic parameters of the subjects

Age	Frequency N=635	Percentage
15-19	4	0.6%
20-24	108	17.1%
25-29	260	40.9%
30-34	167	26.3%
35-39	92	14.5%
40-44	4	0.6%
Parity	Frequency N= 635	Percentage
0	150	23.6%
1-4	416	65.5%
5 and above	69	10.9%

The 25-29 age group had the highest number of subjects while expectedly the 40-44 had the least number of subjects. The 1-4 parity group had the highest frequency while 5 and above had the least number of subjects.

Table 2: Showing linear regression analysis of the relationship of some parameters with birth weight of the baby

Parameter	Co-efficient (r)	P-value
Parity		
0	0.01	0.723
1-4	0.145	0.875
5 and above	0.204	0.017
Age of subjects		
15-19	-0.11	0.816
20-24	0.116	0.802
25-29	-0.041	0.929
30-34	-0.015	0.975
35-39	0.054	0.907
40-44	0.400	0.554
Body mass index		
First trimester	0.021	0.026
Second trimester	0.017	0.037
Third trimester	0.016	0.065

Body surface area		
First trimester	0.489	0.0060
Second trimester	0.580	0.0076
Third trimester	0.611	0.0086
Weight		
First trimester	-0.345	0.283
Second trimester	-0.870	0.352
Third trimester	0.328	0.024
Height	0.175	0.464
Sex of baby	0.296	0.003

Parity had a positive correlation with the birth weight of the baby which became stronger and statistically significant with increasing parity. Age range of 40-44 also had a stronger positive correlation with the birth weight of the baby compared with other age ranges. This relationship was however not statistically significant. The first and second trimester mean body mass index had a positive correlation with weight which was statistically significant. The first, second and third

trimester body surface areas had positive correlation with the birth weight of the baby which were statistically significant. The sex of the baby also had a positive correlation that was statistically significant while the weight of the baby in the third trimester and height correlated positively with the birth weight of the baby while that of the third trimester weight was statistically significant, that of height was not statistically significant.

Table 3: Showing the predictive values of body mass index and body surface area

Parameter	Sensitivity	Specificity	Negative predictive value	Positive predictive value
Body mass index	73%	31%	97.8%	64%
Body surface area	84%	65%	99.4%	73%

Overall, body surface area had a better sensitivity, specificity, negative and positive predictive value in predicting a large or small baby than body mass index.

IV. DISCUSSION

This study was carried out in the Obstetrics and Gynaecology department of Federal Teaching Hospital, Abakaliki among 635 booked pregnant subjects attending antenatal care in the facility. These subjects were followed through antenatal care and delivery. It was aimed at determining if there was any correlation between maternal anthropometric measurements and the birth weight of the baby. There is considerable evidence that the birth weight of a baby is dependent on the mother, whose influence acts more through genes transmitted to the baby. Trans-placental exchange provides all the metabolic demands of fetal growth. Uterine and umbilical flow rates are in turn dependent to a large extent on the vascularisation of the placenta. Hence, factors influencing placental vascular development are likely to impact on fetal growth and development.⁴

The findings of this study highlighted the interrelations between the body physique of the mother (BMI at different trimesters, weight at different trimesters, height), socioeconomic class, parity, sex of the baby, age of the mother and the birth weight of the baby. Significant positive correlations were observed as regards the parameters. The results of the study are in agreement with many other studies which indicated that

neonatal growth, as reflected by the birth weight are mostly influenced by maternal BMI (evidenced by weight and height of participants), body surface area and several other factors including the sex of the baby, parity and socio-economic factors which also has some on the health of any pregnancy.^{4,6,7,8,9} One study however did not find any statistically correlation between the neonatal birth weight and BMI as found in this study³. As was noted in most of the literature reviewed, pre-pregnancy BMI and BSA could not be measured as pre-conception care is an evolving field in Obstetrics care in those study areas, as in our environment.

Linear regression analysis showed positive and negative correlation between age and the birth weight of baby, though this was not statistically significant. This shows that age as a possible confounding variable did not influence the birth weight as much and cannot be grouped as a factor that affects the neonatal birth weight and any increment in neonatal weight attributed to age may be due to chance. Parity has long been attributed as a predictor for birth weight of the baby with weight of the baby thought to increase with increasing parity. This was supported by the index study where there was a positive correlation between parity and birth weight for all levels of parity but became statistically significant with increasing parity especially for parity level, 5 and above. The sex of the baby has also been known to be predictor for birth weight. Male babies are generally thought to weigh more than female babies. This study also supported the foregoing as there was a statistically significant positive correlation between birth weight and

sex of the baby. The mean body surface area in the first, second and third trimesters differed from the average body surface area of 1.61 for women and may have been caused by the increase in weight occasioned by pregnancy. Weight is a significant variable in the calculation of body surface area and as such any increment in it would likely also increase the body surface area. The body surface area in all the trimesters correlated with the birth weight of the baby and were statistically significant. There are at the moment no studies comparing body surface area of pregnant women and the birth weight of the baby. However, BMI and body surface area are similar and use height and weight for their calculations, the statistically significant result of correlations between the trimester body surface area and the birth weight of the baby is not surprising (although it was first and second trimester BMI that showed a statistically significant positive correlation in this study).

V. CONCLUSION AND RECOMMENDATIONS

From the study it can be concluded that determinants of birth weight are multifactorial. Mid-trimester body mass index and body surface areas in the three trimesters with their inexpensive ways can offer hope as predictors of birth weight of the neonate, with BSA showing more sensitivity and specificity than BMI. More studies are needed especially for BSA to validate or refute the foregoing. Maternal anthropometric measurements are potentially veritable tools in the evaluation of pregnancy status and prediction of birth weight to assist policy makers with evidence about the state of maternal and child health.

Conflict of Interest

The authors have no conflict of interest to declare.

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Obesity in Pregnant Adolescents: Clinical Correlates, Maternal and Fetal Outcomes

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Abstract- Objective: To evaluate the relationship between pregestational obesity and maternal and fetal outcomes in pregnant adolescents.

Methods: Cross-sectional study conducted among puerperal teenagers of a university hospital in Southern Brazil. Structured questionnaires on sociodemographic and obstetric data were applied.

Results: We evaluated 500 puerperal adolescents with a mean age of 17.77 ± 1.36 . Of these, 31.2% (n=156) had pregestational weight excess. Pregestational weight excess was significantly associated with gestational hypertension ($p=0.037$) and diabetes ($p=0.045$), cesarean delivery ($p=0.040$), and lower adherence to prenatal care (24.7%, $p=0.007$).

Keywords: obesity, adolescent, pregnancy outcomes.

GJMR-E Classification: NLMC Code: WQ 209



OBESITY IN PREGNANT ADOLESCENTS CLINICAL CORRELATES MATERNAL AND FETAL OUTCOMES

Strictly as per the compliance and regulations of:



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Conclusion: Pregestational weight excess in adolescence is related to unfavorable maternal and fetal outcomes. We emphasize the importance of a closer look at this population still in development to identify nutritional disbalances and promote adequate weight gain.

Keywords: obesity, adolescent, pregnancy outcomes.

I. INTRODUCTION

Adolescence is a period marked by transitions and search for new experiences, such as sexual awakening, making girls more susceptible to unwanted pregnancy. Poverty and socioeconomic inequalities can further increase rates of teenage motherhood, mostly due to knowledge gaps and lack of informations about contraception.

In Brazil, 547,564 babies are born annually to adolescent mothers, accounting for 18% of all births and 11.43% of births in the South region¹. Adolescence is a period of woman's life when major physical, cognitive, and social transformations occur, marking the transition from childhood to adulthood. Adolescent pregnancy is a public health problem and may be related to the occurrence of maternal-fetal complications such as preeclampsia, prematurity, infections, low fetal weight, among others^{2,3}.

There is closely intertwined between maternal nutritional status before and during gestation and neonatal outcomes⁴. Pregnancy before the age of 15 years old can be harmful to maternal and fetal health since both are under physical development and can compete for nutrients. This competition may increase the odds of low neonatal weight, micronutrient deficiencies, and fetal growth restriction⁵.

Obesity is a complex and multifactorial disease with rising prevalence worldwide⁶. In the last decades, rates of weight excess among Brazilian adolescent girls have nearly tripled⁷. Pregestational obesity is a risk factor for excessive weight gain during pregnancy and is associated with complications such as diabetes, postpartum hemorrhage, infections, thromboembolic events, and disturbs in childbirth⁸. It can also cause hypertensive syndromes, which lead to poor perinatal outcomes⁹. Maternal obesity is also associated with neonatal events such as fetal macrosomia, increased admission in the neonatal intensive care unit, congenital disabilities, hypoglycemia, low Apgar score, and death¹⁰.

The combination of adolescent pregnancy and obesity can further impact health outcomes in both generations. Therefore, this study aims to evaluate the relationship between pregestational weight excess and the occurrence of maternal and fetal outcomes among

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pregnant adolescents in a university hospital in Southern Brazil.

II. METHODS

Between November 2014 to March 2016, we conducted a cross-sectional study carried out among puerperal adolescents (10 to 19 years old) that attended a university hospital in southern Brazil. We interviewed the adolescents in the postpartum period, after they signing a free and informed consent form and answered questionnaires on socio-demographic, gestational and perinatal data. Ethics Committee of Hospital de Clínicas de Porto Alegre approved the project. (protocol number 14-0491).

Pregestational nutritional status was analyzed using Anthroplus software, and body mass index (BMI) z-score from 1 to -1 was considered eutrophic and $\geq +1$ weight excess¹⁴. We evaluated gestational BMI according to the Atalah curve published in 1997¹⁵. Weight gain during pregnancy was defined suitable from 12.5-18 kg for those with initial low weight, 11.5-16 kg for eutrophic, 7-11.5 kg for overweight, and 5-9 kg for those obese, as recommended by the IOM (*Institute of Medicine*)¹⁶.

Maternal clinical variables evaluated were menarche, age at first sexual intercourse, number of gestations/parity, type of delivery, number of prenatal visits, previous and gestational diseases such as hypertension, diabetes, gestational hypertension and diabetes, obesity, anemia, and preeclampsia. According to the World Health Organization (WHO) criteria, the birth is preterm when it occurs before 37 weeks¹⁷. We classified hypertensive disorders according to the recommendation of ACOG (*American Congress of Obstetricians and Gynecologists*)¹⁸.

Fetal variables collected were gestational age at birth, sex, weight, length, hospitalization in the neonatal intensive care unit (ICU), and complications such as respiratory dysfunction and Apgar score. We evaluated gestational age at birth using the Capurro method.

Data were analyzed using SPSS (*Statistical Package for the Social Sciences*) version 18.0 (SPSS Inc., Chicago, IL, EUA®). Categorical variables are presented by absolute number (n) and percentage (%), symmetric continuous variables by the mean and standard deviation (SD), and continuous variables asymmetric by the median and interquartile range [25-75 percentile]. We used a Chi-square test for categorical variables and t-test for quantitative variables. We considered, for all analyses, a significance level of 5% ($p < 0.05$) and a 95% confidence interval.

III. RESULTS

We evaluated five hundred adolescents and their respective newborns. Maternal mean age was 17.77 ± 1.36 years, with the mean age at first sexual

intercourse at 14.8 ± 1.5 years. 57.6% (n=235) had a family income of 1.5 to 3 minimum wages, and 63% had white skin color. Primiparous women composed 83.4% of the sample, and 84.8% (n=420) were single with a partner. Regarding pregestational nutritional status, 31.2% (n=156) were weight excess. Table 1 shows other characteristics of the sample.

Table 2 shows the association of pregestational body mass index classification with maternal and fetal outcomes. Mothers with pregestational weight excess were more likely to attend fewer prenatal consultations (24.7% vs. 36.3%, $p=0.007$) and have excessive weight gain during pregnancy than the others (62.2% vs. 32.9%, $p < 0.001$). Prevalence of gestational hypertension (5.1% vs. 1.7%, $p=0.037$) and gestational diabetes (4.5% vs. 1.5%, $p=0.045$) were higher in the weight excess group when compared to the lean/eutrophic group. The proportion of birth by cesarean was also significantly higher in weight excess adolescents (24.4% vs. 17.2%, $p=0.04$).

Children of weight excess mothers had a longer length (48.3 cm vs. 47.5 cm, $p=0.018$) and weight (3.199 kg vs. 3.040 kg, $p = 0.020$) at birth, as observed in figures 1 and 2, respectively. Prematurity, neonatal ICU admission, respiratory dysfunctions, and Apgar score were not associated with pregestational weight excess.

IV. DISCUSSION

Pregnancy in women before the age of 19 years is characterized by poorer outcomes when compared to those aged 20-24 years¹⁹. One explanation for this is that teenage mothers are smaller, due to uncompleted growth at conception. Competition for nutrients can occur between the still developing mother and the fetus, causing developmental impairment in one or both parts. The deficiency of nutrients and energy due to gestation can further impair growth and make adolescent mothers more prone to metabolic imbalances such as obesity and cardiovascular diseases in adulthood²⁰.

Obesity is a growing public health problem. In the United States, the prevalence of overweight in girls aged 12 to 19 years was 4.7% in 1970, increasing to 15.4% in 2002²¹. In Brazil, weight excess affects more than 23% of teenage women⁷. Obesity during adolescence can persist in adulthood, increasing the risk of associated diseases such as hypertension, diabetes mellitus, osteoarthritis, and cardiovascular disease²². Furthermore, maternal obesity is associated with adverse obstetric outcomes, such as increased cesarean rates, preeclampsia and, gestational diabetes. A menarche is a late event in the pubertal process that is related to genetic, environmental, and nutritional factors. Literature shows that adolescents with a higher risk of obesity in adulthood are those with early menarche and those with a short period between

menarche and first parturition³⁷. We also observe this correlation in our study, as weight excess young women had menarche at an earlier age.

During pregnancy, women with overweight and obesity should gain a maximum of 11,5 and 9 kg, respectively²⁶. Adolescent mothers are more likely to have inappropriate weight gain compared with adult women³⁶, and over 60% of teenage mothers have excessive weight gain. In our study, 31.2% of them had pregestational overweight, and the majority of those gained gestational weight above the recommended for their BMI before pregnancy, corroborating with previous findings^{31,34}. The weight gain can be explained because the body of adolescents has to work to both meet their own growth needs and those of the fetus.

Prenatal consultations provide the necessary medical support during pregnancy, and performing them correctly is necessary to prevent possible complications associated with maternal and fetal health. Pregnant women with weight excess were significantly more likely to have inadequate prenatal care, having less than the six visits recommended by the Brazilian Ministry of Health³². Adolescent mothers may not attend gestational care due to fear or non-acceptance of the pregnancy; therefore, professionals should be rightly trained to guide and stimulate them about gestational care³².

Regarding maternal outcomes, we found a significant association of maternal weight excess with hypertension and gestational diabetes mellitus (GDM), corroborating literature previous findings. Sukalich et al. showed that cesarean delivery, preeclampsia, and gestational diabetes were more frequent in pregnant women with a BMI greater than 25, as well as labor induction and cephalic-pelvic disproportion³⁶. Another study also demonstrated that maternal weight excess and excessive weight gain during pregnancy were associated with an increased risk of gestational hypertension⁴⁶. The association between obesity and GDM can be explained by more propensity of decreased insulin sensitivity before and during gestation in these women^{47,42}.

In our study, 24.4% of overweight adolescents had cesarean deliveries. A study with obese teenage mothers at hospitals in the United States⁴² and Colombia²⁰ found similar results. High prevalence of cesarean deliveries may be related to higher fetal weight in mothers with a still-developing body structure⁴³. Furthermore, we stand out that our study obtained a mean number of the cesarean sections below the national average reported by the Brazilian National Health System Database of 2011⁴⁴. This finding may be related to the fact that these adolescents were in a tertiary hospital that prioritizes vaginal delivery and has specific institutional protocols regarding medical indications of cesarean.

Excessive weight gain during pregnancy and pregestational weight excess can result in newborns with bigger weight and length^{46,48,49}. These findings are in agreement with our study since a significant association of maternal weight excess and anthropometric variables of the babies was found. Pregnant women who are overweight, obesity, or underweight can still have babies of adequate birth weight, provided that they gained appropriate weight during pregnancy¹¹.

V. CONCLUSION

Adolescence is a period of transition in which girls are still in the stage of physical and psychological growth. Gestation alone, at this stage, is already a risk factor for adverse outcomes. Our study demonstrates that these adverse outcomes are potentiated when gestation in adolescence is associated with obesity. Excessive weight increase during pregnancy is also associated with adverse maternal and fetal outcomes, such as preeclampsia, increased rate of cesarean section, and macrosomia. These findings highlight the necessity of further studies in the adolescent population, which accounts for 20% of all deliveries.

This study has a few limitations. Among the significant results, such as the association between obesity and gestational hypertension, confusion factors may be involved. Also, we obtained pre-pregnancy information from participants' reports, depending on memories.

Our study contributes to a better understanding of pregestational weight excess in teenage mothers. The assessment of the initial nutritional status is essential to adjust weight gain during pregnancy, to minimize possible harms to the mother-child binomial. Although historically, the concern with teenage motherhood involves low weight gain and nutritional deficits, increasing rates of obese pregnant adolescents make interventions in eating habits necessary to change this paradigm. Therefore, educational programs orientating this population about contraception, pregnancy, and healthy eating habits should be implemented, as well as actions encouraging early prenatal care.

Table 1: Characteristics of pregnant adolescents and their newborns attended at a university hospital.

	Average	Standard deviation
Mean maternal age, years	17.77	1.36
Mean paternal age, years	22.55	5.26
Mean years of study, years	9.29	2.01
Mean age at first sexual intercourse, years	14.78	1.48
Mean menarch age, years	12.15	1.69
	N	%
Marital status		
Single with partner	420	84.8
Single without partner	62	12.5
Married	13	2.6
Family income		
Up to 1.5 minimum wages	113	27.7
1.5 to 3 minimum wages	235	57.6
Over 3 minimum wages	60	14.7
Referred skin color		
White	315	63.0
Non white	185	37.0
Maternal height		
≤ 150 cm	30	6.0
> 150 cm	470	94.0
Pregestational BMI*		
Underweight	7	1.4
Eutrophic	337	6.4
Overweight	100	20
Obesity	47	9.4
Severe obesity	9	1.8
Weight gain during pregnancy		
Insufficient	147	29.5
Adequate	142	28.5
Excessive	210	42.1
Parity		
Primiparous	416	83.4
Multiparous	83	16.6
Delivery type		
Vaginal	403	80.6
Cesarian	97	19.4
Gestational age		
Preterm**	69	13.8
Full term	430	86.2
Newborn		
Female sex	250	50.2
Length at birth, cm	47.72	3.37
Weight at birth, grams	3085.87	575.35

BMI = Body mass index. * According to criteria by WHO. ** Before 37 weeks of gestation.

Table 2: Association between pregestational weight and maternal and fetal outcomes among adolescent mothers attended at a university hospital in Southern Brazil.

	Underweight/Eutrophy	Weight excess ¹	P value
Mean age at menarche, years	12.38 ± 1,67	11.62 ± 1.63	<0.001*
Apgar score			
1st minute	7.85 ± 1.94	7.95 ± 1.57	0.594
5th minute	9.03 ± 1.58	9.06 ± 1.01	0.833
Number of prenatal care consults			
< 6 consults	122 (36.3)	38 (24.7)	0.007
≥ 6 consults	214 (63.7)	116 (75.3)	
Weight gain during pregnancy			
Insufficient	124 (36.2)	23 (14.7)	<0.001*
Adequate	106 (30.9)	36 (23.1)	
Excessive	113 (32.9)	36 (62.2)	
Pathology during pregnancy			
No	95 (27.7)	44 (28.2)	0.494
Yes	248 (72.3)	112 (71.8)	
Gestational hypertension			
No	228 (98.3)	148 (94.9)	0.037*
Yes	6 (1.7)	8 (5.1)	
Preeclampsia			
No	127 (95.1)	146 (93.6)	0.316
Yes	17 (4.9)	10 (6.4)	
Gestational diabetes			
No	339 (98.5)	149 (95.5)	0.045*
Yes	5 (1.5)	7 (4.5)	
Anemia during pregnancy			
No	216 (63)	108 (69.2)	0.104
Yes	127 (37)	48 (30.8)	
Type of delivery			
Vaginal	285 (82.8)	118 (75.6)	0.040*
Cesarean	59 (17.2)	38 (24.4)	
Labor complications*			
No	313 (91)	140 (89.7)	0.385
Yes	31 (9)	16 (10.3)	
Gestational age			
Preterm	45 (13.4)	23 (14.7)	0.393
Full term	297 (86.6)	133 (85.3)	
Newborn complications**			
No	245 (71.2)	108 (69.2)	0.703
Yes	98 (28.5)	48 (30.8)	

Data is presented as average ± standard deviation or n (%). * Hypertension, placental abruption, disseminated intravascular coagulation, Hellp syndrome, uterine atony/hemorrhage, pulmonary edema, hepatic failure, acute renal failure, ICU hospitalization, blood transfusion or maternal death. ** Prematurity, sepsis, infant respiratory distress syndrome, pathological jaundice, central cyanosis, neonatal tachypnea/apnea, shoulder dystocia or neonatal death.

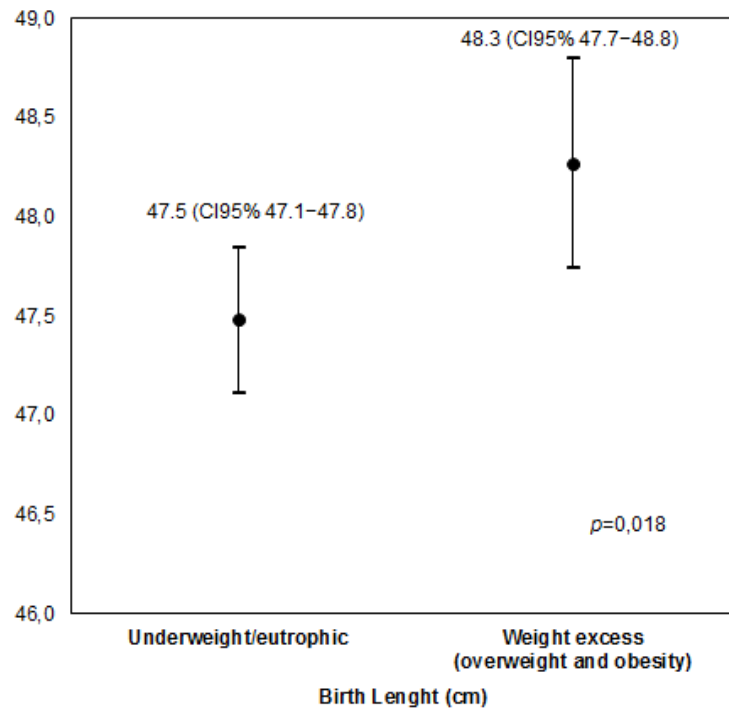


Figure 1: Length at birth in offspring of adolescents with and without pregestational weight excess (overweight and Obesity).

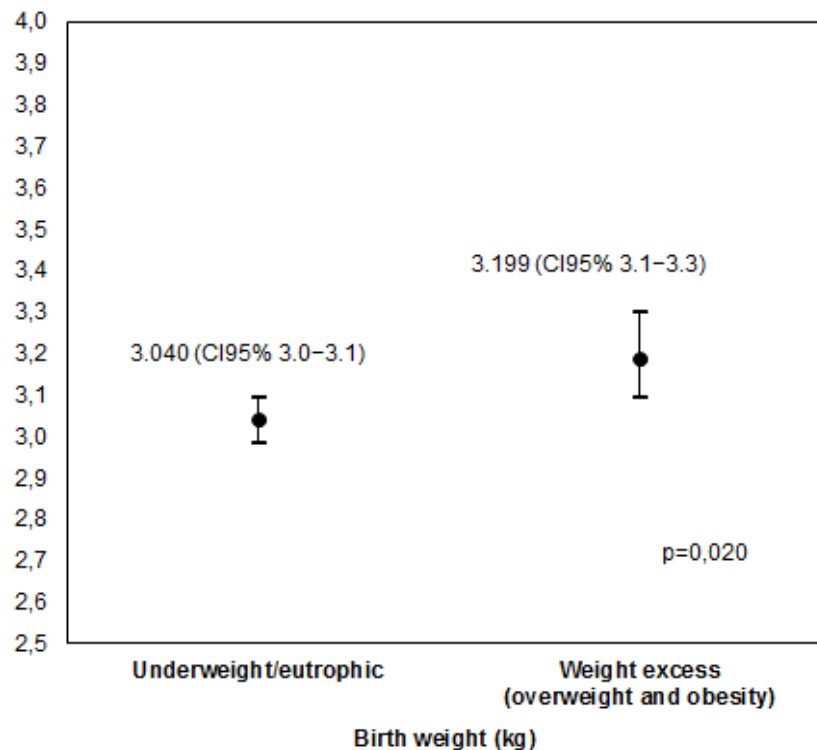


Figure 2: Weight at birth in offspring of adolescents with and without pregestational weight excess (overweight and obesity).

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Contributor statement

JV, EGV, RCS, VLB conceived/ designed the study and worked on data collection. CA and MV worked on data collection. MLOR, JV, VLB and RCS carried out the initial analyses and drafted the initial manuscript. AVP and MS finalized the manuscript, and MS translated it. All authors critically reviewed and revised the manuscript. All authors approved the final manuscript as submitted.

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Abstract- Background: University undergraduates are at an age when experimentation with sex is prevalent. A significant number of young people still indulge in high risk sexual behavior. Hence, profiling safer sex would be important for the future health of this group. More so an improved knowledge among this group could act as a step down during peer interactions with other non-medical undergraduates.

Aim: This study was designed to assess the knowledge and practice of safer sex among Medical undergraduate students and to know to what extent their practice impacts on their health as regards contraction of sexually transmitted infections and having an unwanted pregnancy.

Subjects and methods: In this cross-sectional study, three hundred and fifty (350) Medical undergraduate students were interviewed using pretested semi-structured self-administered questionnaires to assess their knowledge and practice of safer sex.

Keywords: safer sex, medical undergraduates, STIs, unwanted pregnancy.

GJMR-E Classification: NLMC Code: WJ 140, WC 140



PROFILING SAFER SEX AMONG MEDICAL UNDERGRADUATE STUDENTS OF EBONYI STATE UNIVERSITY ABAKALIKI

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Profiling Safer Sex among Medical Undergraduate Students of Ebonyi State University, Abakaliki

Arinze Chidiebele Ikeotuonye ^α, Chidalu Benedicta Ikeotuonye ^σ, Johnbosco Ifunanya Nwafor ^ρ,
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Abstract- Background: University undergraduates are at an age when experimentation with sex is prevalent. A significant number of young people still indulge in high risk sexual behavior. Hence, profiling safer sex would be important for the future health of this group. More so an improved knowledge among this group could act as a step down during peer interactions with other non-medical undergraduates.

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Subjects and methods: In this cross-sectional study, three hundred and fifty (350) Medical undergraduate students were interviewed using pretested semi-structured self-administered questionnaires to assess their knowledge and practice of safer sex. Variables were coded and analyzed with Epi info version 7 of the Centre for disease control, Atlanta. Data were presented as percentages and tables. The level of statistical significance was set at $p=0.05$ (providing 95% confidence interval). Associations between variables were tested using ANOVA and χ^2 test. Logistic regression was applied to determine the influence of confounding variables on the primary outcomes.

Results: 52.3% of the respondents were aged 20-24 years, 31.4% were in 500 level of study (constituting majority of the respondents), 64.6% of respondents were males, and 54% were Catholics while 96% of the respondents were single. Among the respondents, the 6th year group had better knowledge of safer sex, statistically significant only for responses to safer sex involving protection against STIs, protected intercourse and all forms of contraception that prevents STIs ($p=0.012, 0.011$ and 0.016 respectively). The 5th and 6th year group identified condom use as a method of safer sex in 100% and 87% of the cases compared to other groups ($p=0.0008$). The groups however had similar responses to abstinence as a method of safer sex ($p=0.777$). Respondents in their 1st year and 2nd year of study were more likely to have contracted an STI in the past, have had an unwanted pregnancy and have more than three sexual partners ($p=0.048, 0.021, 0.416$ respectively). The 6th year group used condom consistently in 75% of cases compared to other groups ($p=0.151$). The 3rd year group had the highest number of respondents who were sexually active (42.9%, $p=0.535$). Logistic regression analysis done to determine the influence of age, religion, sex and marital status on the outcome measures showed that age and religion likely influenced a prior contraction of STIs while age alone likely influenced a prior

unwanted pregnancy (p for age = 0.006, p value for religion = 0.041; $p=0.0012$; OR for age- 0.213 95% CI (0.0712-0.634), OR for religion- 0.433 95% CI (0.186-0.966); OR for age- 0.068 95% CI (0.0132-0.3472) respectively).

Conclusion: It is important to incorporate safer sex education early in the curriculum of Medical undergraduates or during the senior secondary school period as part of health education. This would help reduce the adverse effects risky sexual behavior may have on the education and future reproductive careers of this group. Better knowledge would also encourage step down information during peer interactions with their non-Medical counterparts.

Keywords: safer sex, medical undergraduates, STIs, unwanted pregnancy.

1. INTRODUCTION

Safer sex is sexual activity engaged in by people who have taken precautions to protect themselves against sexually transmitted infections (STIs) and pregnancy¹. It can also be referred to as safe sex or protected sex.² The term safer sex is preferred due to the fact that these practices reduce but do not completely eliminate the risk of disease transmission². In contrast, unsafe sex or unprotected sex is sexual activity engaged in without precautions. Sexual behavior is determined by the attitudes of the individual concerned and underlies the thinking, beliefs, values and lifestyles of the individual as it relates to their sexuality.³

Safer sex practices became more prominent in the late 1980's as a result of the AIDS epidemic. Promoting safer sex is now one of the aims of sex education. Safer sex is regarded as a harm reduction strategy aimed at reducing risks, though not absolute.⁴ Although, some safer sex practices include contraceptive methods, most forms of contraception do not protect against all or any STIs. Likewise, some form of safer sex practices like partner selection and low risk sexual behavior are not effective forms of contraception. The term safer sex was coined in response to the AIDS epidemic and its concept included limiting the number of sexual partners, using prophylactic antibiotics, avoiding bodily fluid exchange and resisting the use of drugs that reduce inhibitions for high risk sexual behaviours.⁵ Some safer sex precautions include avoiding physical contacts (masturbation, phone sex, cybersex). These minimize the risk of exchange of body fluids.² Others include non-penetrative sexual practices like kissing, rubbing or stroking, use of barrier method,

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example condoms (male and female), dental dams, medical gloves, protected sex toys.² Proper use of barriers such as condoms, depend on the cleanliness of the surfaces of the barrier and method of their application. Handling can pass contamination to and from surfaces of the barrier unless care is taken.²

Acknowledging that it is usually impossible to have entirely risk free sex with another person, proponents of safer sex recommend that some of the following methods be used to minimize the risk of STI transmission and unwanted pregnancy- immunization, male circumcision, periodic STI testing, monogamy and 'polyfidelity'.² While the use of condoms can reduce transmission of STIs, it does not do so completely.⁶ The suggested effectiveness of condoms in the prevention of STIs is from 85-95%. It is deemed unlikely for effectiveness greater than 90% due to slippages, breakages and incorrect use. Inconsistent use further reduces its effectiveness to as low as 60-70%.⁶

The Bill Gate foundation in March 2013 offered 100000 US dollars grant for a condom design that significantly preserves or enhances pleasure to encourage more males to adopt the use of condoms for safer sex.² Sexual abstinence is sometimes promoted as away to avoid the risks associated with sexual contact, though STIs may also be transmitted through non-sexual means or by involuntary sex.⁵ Evidence does not support the use of abstinence only sex education. They have been found to be ineffective in decreasing HIV infection rates.⁵

University undergraduates are mostly at an age when sexual experimentation is prevalent. The knowledge and proper practice of safer sex is important for their future health viz preventing them from contracting sexually transmitted infections and having an unwanted pregnancy. Both can have a deleterious effect on their reproductive health and education. A significant number of these young people still indulge in high risk sexual behavior. This study seeks to primarily have an idea of the knowledge and practice of safer sex amongst Medical undergraduate students and to know to what extent their practice impacts on their health as regards contraction of STIs and having an unwanted pregnancy.

II. SUBJECTS AND METHODS

Between 15th December 2016 and 1st June, 2017, we conducted a cross-sectional observational study of 400 Medical undergraduate students of Ebonyi State University Teaching Hospital, Abakaliki. Ebonyi State University is located in South Eastern Nigeria and has four major campuses located at Ezzamgbo (main campus), Presco (hosting 2nd year to 6th year Medical students), Centre for Arts and Sciences (hosting first year Medical Students) and Ishieke campus. There are six levels in the Medical School of Ebonyi State

University in increasing order of seniority, from 100 level/ 1st year to 600 level/ 6th year. Respondents were obtained from the different levels of study from the Medical School, excluding non-Medical students. Each level or study group were approached just before the start of a lecture and their consent obtained after the purpose of the study was explained to them. Respondents to participate in the study were then selected using systematic random sampling technique whereby every second seated student was selected after randomly selecting a starting point.

The questionnaires were pretested among non-Medical students of Ebonyi State University who were not part of the study for clarity, assessment of length of time of administration, comprehension and other attributes. The questionnaire assessed the socio-demographic data of the participants, their knowledge and practice of safer sex and outcomes as measured by contraction of STIs or having had an unwanted pregnancy. Informed consent was obtained from the respondents before the questionnaires were administered and ethical approval was obtained from the authorities.

Data were coded and analyzed using Epi info version 7.0 of the Center for Disease and Control, Atlanta, 2015. The χ^2 and ANOVA tests were used for statistical analysis, logistic regression analysis was applied to determine the relationship between the outcome measures and some confounding variables such as age, religion, sex and marital status.

III. RESULTS

A total of the 400 questionnaires distributed out of which 350 questionnaires were properly filled and available for analysis, giving a recovery rate of 87.5%.

From the data collated, most of the respondents belonged to the age group 20-24 (52.3%) while the least group was 35-39 (0.6%). Most of the respondents 110 (31.4%) were in 500L of study while the least were in 200L. 124 (35.4%) of respondents were females while 226 (64.6%) of respondents were males. Most of the respondents 189 (54%) were Catholics. Expectedly, 336 (96%) of respondents were single.

Table 1: Frequency distribution of socio-demographic variables of the respondents

Socio-demographic Variables	Frequency N=350	Percentage
Age		
15-19	39	11.1%
20-24	183	52.3%
25-29	110	31.4%
30-34	16	4.6%
35-39	2	0.6%
Sex		
Male	226	64.6%
Female	124	35.4%
Marital status		
Single	336	96%
Married	14	4%
Religion		
Anglican	36	10.3%
Catholic	189	54%
Pentecostal	113	32.3%
Traditional	12	3.4%
Year of study		
100L	36	10.3%
200L	26	7.5%
300L	77	22%
400L	44	12.6%
500L	110	31.4%
600L	57	16.3%

From the above it is noted that the 20-24 age group had the highest population among the age groups while the 35-39 year old group had the least. There were more males than females and expectedly,

96% of respondents were single. Among the respondents also, 54% were Catholics while the 5th year group had the highest respondents among the classes/levels of study, 31.4%.

Table 2: Frequency distribution and comparison of responses as regards knowledge of safer sex among the groups

Parameters	Yr1 N=36	Yr2 N=26	Yr3 N=77	Yr4 N=44	Yr5 N=110	Yr6 N=57	X ²	P-value
Safer sex involves								
i. Prevention of unwanted pregnancy	12 (33.3%)	15 (57.7%)	36(46.8%)	27 (61.4%)	69 (62.7%)	45 (78.9%)	10.69	0.06
ii. Protection against STIs	6 (16.7%)	12 (46.2%)	30 (39%)	24 (54.5%)	72 (65.5%)	39 (68.4%)	14.53	0.012
iii. All forms of contraception that protects against STIs	18 (50%)	9 (34.6%)	15 (19.5%)	24 (54.5%)	72 (65.5%)	30 (52.6%)	13.88	0.016
iv. Protected intercourse	6 (16.7%)	9 (34.6%)	63 (81.8%)	24 (54.5%)	75 (68.2%)	39 (68.4%)	14.69	0.011
v. All forms of contraception	3 (8.4%)	6 (23.1%)	9 (11.7%)	6 (13.6%)	45 (40.9%)	6 (10.5%)	13.46	0.02
Methods of safer sex								

Condoms	18 (50%)	18 (69.2%)	48 (62.3%)	33 (75%)	96 (87.3%)	57 (100%)	20.99	0.0008
Diaphragm	6 (16.7%)	9 (34.6%)	12 (27.3%)	30 (68.2%)	45 (40.9%)	39 (68.4%)	23.87	0.0002
Having one faithful partner free from STI	9 (25%)	3 (11.5%)	33 (42.9%)	18 (41%)	63 (57.3%)	36 (63.2%)	9.77	0.082
Kissing	0 (0%)	0 (0%)	3 (3.9%)	6 (13.6%)	0 (0%)	0 (0%)	10.35	0.066
Sex toys	0 (0%)	3 (11.5%)	0 (0%)	3 (6.8%)	0 (0%)	0 (0%)	10.73	0.06
Dental dams	0 (0%)	6 (23.1%)	3 (3.9%)	0 (0%)	0 (0%)	0 (0%)	20.64	0.0009
Abstinence	12 (33.3%)	6 (23.1%)	39 (50.6%)	15 (34.1%)	45 (41.9%)	15 (26.3%)	2.495	0.777
Phone sex	0 (0%)	3 (11.5%)	3 (3.9%)	9 (20.5%)	6 (5.5%)	3 (5.3%)	7.322	0.198
Non-penetrative sex	0 (0%)	3 (11.5%)	6 (7.8%)	18 (40.9%)	15 (13.6%)	18 (31.6%)	14.945	0.011
Masturbation	0 (0%)	3 (11.5%)	3 (3.9%)	6 (13.6%)	3 (2.7%)	0 (0%)	7.071	0.215

- a) Knowledge of safer sex was observed in increasing level of study. Respondents in year 6 had the highest correct response to prevention of unwanted pregnancy being a component of safer sex (78.9%). This was however not statistically significant ($p=0.06$). Same trend is observed for safer sex involving methods for protection against sexually transmitted infections (STIs) with 68.4% of respondents in year 6 correctly responding and the difference here was statistically significant ($p=0.012$). Respondents in year 6 again had the best response as regards safer sex involving all types of contraception which was statistically significant ($p=0.02$)
- b) Knowledge of methods for safer sex was noted in increasing level of study. All respondents in their sixth year of study correctly responded to condoms being a method for safer sex and the difference noted in the groups was statistically significant ($p=0.0008$). All groups except year 3 and 4 correctly responded to kissing not being a method of safer sex. This was however not statistically significant. There was a similar response among the groups for abstinence which is not a method of safer sex. This was not statistically significant ($p=0.777$).

Table 3: Showing the frequency and comparison of year of study with outcome measures.

Parameter	Yr1 N=36	Yr2 N=26	Yr3 N=77	Yr4 N=44	Yr5 N=110	Yr6 N=57	X ²	P-value
Sexually active	9 (25%)	9 (34.6%)	33 (42.9%)	9 (20.5%)	36 (32.7%)	24 (42.1%)	0.862	0.353
Prior screening for STIs including HIV	21(58.3%)	9 (34.6%)	21 (27.3%)	9 (20.5%)	51 (46.4%)	21(36.8%)	8.289	0.141
Use of condom always during sex	4 (44.4%)	1 (3.8%)	10 (30.3%)	3 (33.3%)	12 (33.3%)	18 (75%)	6.723	0.151
Number of sexual partners								
1	3 (33.3%)	3 (33.3%)	29 (87.9%)	8 (88.9%)	27 (75%)	24 (100%)		
2	3 (33.3%)	0 (0%)	2 (6.1%)	1 (1.1%)	4 (11.1%)	0 (0%)		
3	0 (0%)	6 (66.6%)	0 (0%)	0 (0%)	3 (8.3%)	0 (0%)	1.011	0.416
>3	3 (33.3%)	0 (0%)	2 (6.1%)	0 (0%)	2 (5.6%)	0 (0%)		
Previous STI	9 (25%)	3 (11.5%)	6 (13.6%)	0 (0%)	15 (13.6%)	3 (5.3%)	2.32	0.048
Previous unwanted pregnancy for self or partner	6 (16.7%)	6 (23%)	0 (0%)	6 (13.6%)	9 (8.2%)	0 (0%)	2.866	0.021

Among the respondents, the third year group had the highest number of sexually active respondents (42.9%) compared to the other groups. This was however not statistically significant ($p=0.353$). Surprisingly, the first year group had the highest number of respondents who had previously been screened for STI including HIV in the past (58.3%) compared to the

other groups. This was however not statistically significant ($p=0.141$). Among respondents in the 6th year group, 75% of them used condoms consistently. This was however not statistically significant when comparisons were made with the other groups ($p=0.151$). Respondents in the first year of study were more likely to have more than one sexual partner

(33.3%) compared with other groups. This was however not statistically significant ($p=0.416$). Respondents in year 1 and 2 of study were more likely to have had a previous STI or unwanted pregnancy respectively

among the groups (25%, 23% respectively). The differences noted were statistically significant ($p=0.048$ and 0.021 respectively).

Table 4: Logistic regression analysis showing the influence of some sociodemographic parameters (confounders) on the outcome measures

a) Prior history of sexually transmitted infection (STI)

Parameters	z- statistic	P-value	OR 95% CI	Likelihood ratio
Age	-2.7784	0.006	0.213 (0.0712-0.634)	15.22
Religion	-2.043	0.041	0.433 (0.186-0.966)	
Sex	-0.1567	0.876	0.903 (0.253-3.23)	
Marital status	-0.031	0.976	0.0001 (0.000-1.566)	

Age and religion were factors more likely to influence the behavior of respondents as regards having previously contracted a sexually transmitted disease including HIV.

b) Prior history of unwanted pregnancy

Parameters	Z-statistic	P-value	OR 95% CI	Likelihood ratio
Age	-3.228	0.0012	0.068 (0.0132-0.3472)	11.42
Religion	-0.809	0.419	0.697 (0.290-1.673)	
Sex	1.619	0.106	4.295 (0.735-25.08)	
Marital status	-0.022	0.982	0.0002 (0.0000-1.562)	

Only age was likely to influence sexual behavior of respondents as regards themselves or their partners having had an unwanted pregnancy previously.

IV. DISCUSSION

The study was conducted among Medical undergraduate students of Ebonyi State University, Abakaliki at different levels of Medical training. It was aimed at ascertaining the knowledge and practice of safer sex among them and how it has impacted on their health viz a past history of unwanted pregnancy and contraction of STIs. University undergraduates are at an age when experimentation with sex is prevalent. The findings of this study highlighted the interrelationships between year of study and knowledge/practice of safer sex; and also between practice and contraction of STIs and unwanted pregnancy among respondents. Some statistically significant difference were noted between individual variables. The results of this study are in agreement with the fact that older (higher level) Medical students are more knowledgeable than their younger colleagues (lower level of training) in safer sex. This knowledge impacted their sexual behavior as a significant number of older students in higher classes modified their sexual behaviors with the knowledge they had. Respondents in year 1 and 2 of study were more likely to have more than 3 sexual partners and this was observed in the higher levels of previous contraction of STI and having an unwanted pregnancy in the two groups compared to the other groups. This highlights the need for introduction of safer sex earlier in the curriculum of Medical training.

Assessment of the knowledge of what safer sex involved showed a generally average knowledge of safer sex involving methods to prevent unwanted

pregnancy. There was an increase in knowledge of this particular component with increasing level of study. In Nigerian Medical curriculum, exposure to Obstetrics and Gynaecology usually starts at the 5th year of Medical education. This may explain the trend noted in this study where all the parameters used to assess knowledge of safer sex showed an increased knowledge with higher levels of Medical education. This is similar to a study conducted at University of Lagos, though among non-Medical students. Assessment of the methods for achieving safer still showed an average knowledge among the respondents but with greater knowledge noticed among the 5th and 6th year groups. All respondents in the 6th year group responded correctly to the important role of condom use in practicing safer sex while there was similar response as regards abstinence being a method to achieve safer sex. Abstinence in the sense is not a safer sex method. This shows that more work needs to be done to train and retrain young adults on safer sex. There were slight variations between the findings of this study and that done by Apoola A et al at the University of Lagos. The dissimilarity would likely be due to the fact that the respondents in this study are Medical students and would have been exposed to some form of lectures on safer sex compared to their non-Medical counterparts.

A significant proportion of the respondents were sexually active, more in the first and second year groups and this group were more likely to have contracted a sexually transmitted disease in the past and themselves or their partners had an unwanted pregnancy. They are

also the group in this study shown to have more than three sexual partners compared to their older counterparts and not have used condoms consistently. These findings may be attributed to the fact that they have a poorer knowledge of safer between the groups, are less experienced and younger. Some of these findings are similar to the findings from the studies by Apoola A et al, Chin B et al, Lau JT et al and Zhang D et al.

Logistic regression analysis done to determine the effect of age, religion, marital status and sex on the outcome measures showed that age and religion were likely to influence the respondents sexual behaviors as regards having had a previous STI and age likely the only factor to influence the sexual behaviors as regards having an unwanted pregnancy in the past. This is not surprising as age and religion play an important part in sexual behavior in Africa. Most of the respondents were Christians with up to 54% Catholics. These religious groups preach abstinence and prohibit pre-marital sex. More so, as individuals get older, they gain experience and are not likely to indulge in high risk sexual behaviors as shown in this study.

V. CONCLUSION AND RECOMMENDATIONS

Undergraduates are truly at an age when sexual experimentation is rife. Knowledge and practice of safer sex is still poor or at best average. There are other factors that influence sexual behaviors besides the knowledge of safer sex such as age and religion. Individual at a lower level of training are more likely to engage in high risk sexual behavior with attendant consequences that may jeopardize their future reproductive career.

From the foregoing, it is imperative that safer sex should be incorporated into the curriculum of Medical undergraduates at an early stage of training. This could also be incorporated into the senior secondary school curriculum as part of health education. When fully armed with the knowledge of safer sex, Medical undergraduates can be the bridge between awareness campaigns for safer sex and their non-Medical counterparts, acting to step down information to this group that they often interact with while practicing same.

Conflict of Interest

The authors have no conflict of interest to declare.

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Cuando Lo Infrecuente Es Lo Más Probable. Síndrome Hemolítico Urémico Atípico En El Postparto, Reporte De Dos Casos

By Carlos Pizarro, Juan Camilo Cifuentes, Diego Oquendo,
Silvana Jiménez & Daniela Osorio

Abstract- Introduction: Hemolytic uremic syndrome in postpartum is an orphan disease, characterized by microangiopathic hemolytic anemia, thrombocytopenia, and acute kidney injury. It occurs due to abnormal complement activation, which activates the membrane attack complex.

Pregnancy is characterized by being a pro inflammatory state, which has been related as one of the possible triggers for this pathology.

According to its pathophysiology, the use of "Eculizumab" has been established as a gold standard treatment in this pathology. This is a humanized IgG2 monoclonal antibody that blocks the conversion of C5 to C5a, with subsequent inhibition in the formation of the membrane attack complex.

Keywords: renal insufficiency, postpartum period, atypical hemolytic uremic syndrome, thrombocytopenia.

GJMR-E Classification: NLMC Code: WJ 140



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Cuando Lo Infrecuente Es Lo Más Probable. Síndrome Hemolítico Urémico Atípico En El Postparto, Reporte De Dos Casos

Carlos Pizarro ^α, Juan Camilo Cifuentes ^σ, Diego Oquendo ^ρ, Silvana Jiménez ^ω & Daniela Osorio [¥]

Resumen- Introducción: El síndrome hemolítico urémico atípico (SHUa-) es una enfermedad huérfana, caracterizada por anemia hemolítica microangiopática, trombocitopenia e injuria renal aguda. Se debe a una activación anómala del complemento, que activa el complejo de ataque de membrana.

El embarazo se caracteriza por ser un estado pro inflamatorio, que se ha visto relacionado como uno de los posibles desencadenantes de esta patología.

De acuerdo a su fisiopatología, se ha establecido el uso de "Eculizumab" como un pilar de tratamiento en esta patología. Este es un anticuerpo monoclonal humanizado IgG2 que bloquea la conversión de C5 a C5a, con la subsecuente inhibición en la formación del complejo de ataque a membrana.

Objetivo: Se presenta el caso de 2 pacientes en estado de postparto que debutan con hipertensión, anemia, trombocitopenia, injuria renal y convulsión, en quienes se logra obtener reversión de la falla renal y mejoría de hemólisis tras la administración de eculizumab.

Conclusión: Aunque es una entidad rara, debe sospecharse SHUa en paciente en estado de embarazo o postparto que cursan con anemia hemolítica y como diferencial de los trastornos hipertensivos del embarazo. El tratamiento temprano puede mejorar notoriamente el curso de la enfermedad y prevenir evolución a falla renal crónica.

Palabras Claves: insuficiencia renal, periodo posparto, síndrome hemolítico urémico atípico, trombocitopenia.

Abstract- Introduction: Hemolytic uremic syndrome in postpartum is an orphan disease, characterized by microangiopathic hemolytic anemia, thrombocytopenia, and acute kidney injury. It occurs due to abnormal complement activation, which activates the membrane attack complex.

Pregnancy is characterized by being a pro inflammatory state, which has been related as one of the possible triggers for this pathology.

According to its pathophysiology, the use of "Eculizumab" has been established as a gold standard treatment in this pathology. This is a humanized IgG2 monoclonal antibody that blocks the conversion of C5 to C5a, with subsequent inhibition in the formation of the membrane attack complex.

Objective: This paper exposes cases of two postpartum patients presenting with hypertension, anemia, thrombocytopenia, kidney injury, and seizure, in which reversal of renal failure and improvement of hemolysis are achieved after administration of eculizumab.

Conclusion: Although it is a rare entity, a HUS should be suspected in a patient in a state of pregnancy or postpartum who presents with hemolytic anemia and as a differential of hypertensive disorders of pregnancy. Early treatment can markedly improve the course of the disease and prevent progression to chronic kidney failure.

Keywords: renal insufficiency, postpartum period, atypical hemolytic uremic syndrome, thrombocytopenia.

I. INTRODUCCIÓN

La microangiopatía trombótica (MAT) es un desorden infrecuente caracterizado por lesión endotelial y trombosis de la microvasculatura manifestado con anemia hemolítica microangiopática (deformidad eritrocitaria o esquistocitosis), lactato deshidrogenasa elevada (LDH), trombocitopenia (<150.000 o disminución >25% de conteo inicial) y lesión de órganos, incluyendo lesión renal aguda(1). En el embarazo, la MAT ocurre principalmente debido a síndrome de Hellp (hemólisis, elevación de enzimas hepáticas y trombocitopenia), menos frecuente por púrpura trombocitopénica trombótica (PTT) y síndrome hemolítico urémico atípico (SHUa) o síndrome hemolítico atípico asociado al embarazo (SHUa-e) (2).

El SHUa-e se caracteriza por una activación descontrolada de la vía alterna del complemento adquirida genéticamente, que se presenta en el periodo de embarazo o postparto, con una incidencia de 1 en 25.000 embarazos (3). Corresponde a una entidad clínica difícil de diagnosticar por presentar síntomas, signos y paraclínicos que se superponen con preeclampsia severa y síndrome de Hellp, se debe sospechar en casos en donde se tenga anemia hemolítica microangiopática y trombocitopenia asociado a una de las siguientes: menos de 20 semanas de gestación, más de 48 a 72 horas de postparto o historia familiar de SHUa (2).

El sistema del complemento corresponde a una parte del sistema inmune que mediante la activación secuencial de proteínas plasmáticas termina en la

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activacin del complejo de ataque a membrana y la lisis de la clula diana.

Se ha tenido una evolucin considerable en el tratamiento de esta patologa, se ha utilizado el recambio plasmtico hasta el tratamiento actual y estndar de oro que es el eculizumab, anticuerpo monoclonal humanizado que bloquea la conversin de C5 a C5a y C5b -9 (complejo de ataque a membrana MAT), de esta manera la activacin del sistema del complemento (5).

A continuacin se presenta el caso de dos pacientes, que constituyeron un desafo diagnstico, al presentarse en el periodo postparto con una sintomatologa que simulaba patologas relacionadas con trastornos hipertensivos asociados al embarazo, causando gran morbilidad en las pacientes, llevndolas a un estado crtico, pero que gracias a una intervencin oportuna con el anticuerpo monoclonal se logra modular con xito, resolviendo la injuria renal aguda hasta niveles de nitrogenados normales.

Caso 1

Paciente femenina de 24 aos de edad, en su segundo embarazo, ingresa a la unidad de cuidado intensivo en da once de postoperatorio de cesrea, adecuados controles prenatales, sin datos de hipertensin previa, ni antecedentes patolgicos. Consulta por cuadro clnico de dos das de evolucin que consiste en cefalea holocraneal progresiva

asociado a disnea, astenia, adinamia y edema de miembros inferiores. Al examen fsico de ingreso, tensin arterial 177/100 mmHG, frecuencia cardiaca 93 latidos por minuto, frecuencia respiratoria 18 respiraciones por minuto, temperatura 37.0 C, edema grado III, palidez generalizada, fundoscopia sin alteraciones arteriovenosas. Paraclnicos en los que se evidencia: anemia severa de volmenes normales, trombocitopenia moderada, lactato deshidrogenasa elevada, lesin renal aguda AKIN 3, enzimas hepticas en rangos de normalidad, resultados resumidos en la tabla 1.

Considerndose inicialmente preeclampsia severa versus sndrome de Hellp incompleto, se inici manejo con sulfato de magnesio y terapia de remplazo renal, a pesar de manejo instaurado continua con necesidad de hemodilisis, elevacin persistente deshidrogenasa, trombocitopenia moderada, anemia normoctica normocmica con requerimiento de transfusin de hemoderivados.

Por evolucin atpica se plantea posibilidad de un diferencial de microangiopata trombtica, por lo que se realizan estudios de extensin: Coombs directo negativo, extendido de sangre perifrica normal. Bajo sospecha de microangiopata trombtica tipo SHUa se inicia plasmafresis, mientras se obtiene reporte de ADAMST 13.

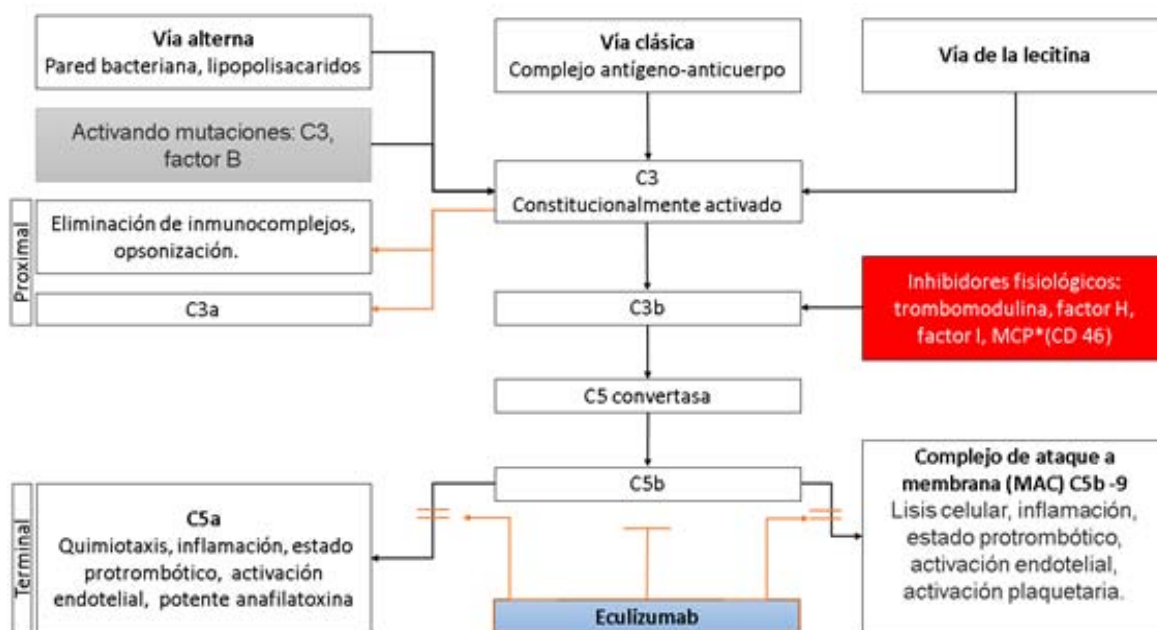


Figura 1: La activacin del complemento puede tener tres vas: clsica, alterna y la va de la lecitina. La regulacin est dada principalmente por inhibidores fisiolgicos. Mutaciones pueden llevar a una activacin persistente o a prdida de la inhibicin que termina en la formacin del complejo de ataque a membrana (MAC) que tiene como fin la lisis celular que lleva a un estado de inflamacin, estado protrombtico, activacin endotelial y plaquetaria persistente. El eculizumab bloquea el paso a C5a y C5b-9. * Protena cofactor de membrana.

Se realizaron 3 sesiones de plasmaferesis, sin modulacion de la hemolisis. Presenta episodio convulsivo con reporte de resonancia magnetica nuclear: encefalopata posterior reversible. Se realizaron extendido de sangre periferica seriados, en el cuarto extendido se identificaron esquistocitos 10%, reporte de ADAMST 13 en rangos de normalidad (77%) con lo cual se descarta purpura trombocitopenica trombotica. Se diagnostica SHUa-e por lo que se inici Eculizumab 900 mg, intravenoso, cada semana por cuatro semanas como terapia de induccion, previa vacunacion: meningococo serotipo A, B, C, Y y W145.

Ante la emergencia de iniciar eculizumab y al no completar quince das de vacunacion, se inici profilaxis antibiotica esquema de amoxicilina 500 mg cada da. Posterior a segunda dosis de eculizumab observamos mejora de paraclnicos, se logr retiro de terapia de reemplazo renal y adecuada evolucion clnica por lo cual se da de alta en las dos semanas posteriores al inicio de eculizumab para continuar manejo ambulatorio.

Tabla 1: Resumen de paraclnicos casos de primer caso.

Paraclnicos	De ingreso	De egreso	Parmetros normales
Leucocitos	8.400	7.200	4.000-10.000 mm3
Neutrfilos %	71.3	48	43-74%
Hemoglobina	5.1	9.6	11-16 gr/dl
Plaquetas	88.000 mm3	218.000 mm3	150.000-400.000mm3
Volumen corpuscular medio	98	94	80-100 fl
Hemoglobina corpuscular media	32.6	33.7	27-32 pg
LDH	4.263	647	313- 618 u/l
AST	53	13	14-36 u/l
ALT	36	25	9-52 u/l
Creatinina	7.8	1.9	0.52 – 1.04 mg/dl
BUN	25	18	9-20 mg/dl
Proteinuria en 24 horas.	2.664		0-150 mg/24 horas
Coombs directo	Negativo		0- 1,1 mg/dl
Extendido de sangre periferica	Esquistocitos 10%		0-0.7 mg/dl
Sedimento Urinario	Glbulos rojos morfologa normal		-
Bilirrubina total	1.1	1.1	-
Bilirrubina indirecta	0.6	0.5	-
ANAs	Negativo		88 – 165 mg/dl
ANCAs	Negativo		14-44 mg/dl

Anti DNA	Negativo		-
C3	103		>5%
C4	41,6		20-30
Ac anti membrana basal glomerular	No realizado		-
ADAMST 13	77%		0- 1,1 mg/dl
Haptoglobina	No realizado		0-0.7 mg/dl
Ecografía hepatobiliar	Normal		-

LDH: lactato deshidrogenasa, AST: aspartato aminotransferasa, ALT: alanino aminotransferasa, BUN: nitrógeno uréico, ANAs: anticuerpos antinucleares, ANCAs: anticuerpos anti citoplasma del neutrófilo.
Fuente: Elaboración propia.

Caso 2

Femenina de 18 años de edad, primigestante con parto vaginal a las 38 semanas. Presentando hemorragia postparto con requerimiento transfusional, control posterior del sangrado y egreso. Reingresa en día doce de postparto, manifestando persistencia de sangrado vaginal en escasa cantidad asociado a cefalea holocreaneal, astenia, adinamia y edema de miembros inferiores. Al examen físico de ingreso, tensión arterial 150/85 mmHG, frecuencia cardiaca 110 latidos por minuto, frecuencia respiratoria 19 respiraciones por minuto, temperatura 37.1°C, palidez generalizada, edema grado II, sangrado vaginal mínimo, no fétido. Inicialmente se considera anemia por sangrado vaginal, se transfunden 3 unidades de glóbulos rojos, llama la atención hipertensión arterial estadio 2, elevación de lactato deshidrogenasa y nitrogenados. A pesar de corregir anemia y sin presencia de sangrado vaginal persiste con elevación de cifras tensionales y alteración en paraclínicos como se muestra en la tabla 2. Se plantea como diagnósticos síndrome de Hellp incompleto.

A pesar de múltiples intervenciones la paciente continúa con anemia normocítica normocrómica, lactato deshidrogenasa elevada, trombocitopenia severa e injuria renal aguda AKIN 3 con necesidad de hemodiálisis. Se propone microangiopatía trombótica

tipo SHUa, iniciándose plasmaféresis quien durante la trasfusión presenta signos de edema agudo de pulmón, falla ventilatoria con requerimiento de ventilación mecánica invasiva, con hemoptisis por tubo endotraqueal se plantea posibilidad de síndrome riñón-pulmón, el cual se descarta por perfil de autoinmunidad negativo, anticuerpo anti membrana basal glomerular negativo.

Persisten signos de hemólisis, trombocitopenia y falla renal, con resultado ADAMST 13 en rangos de normalidad (87%), haptoglobina baja, Coombs directo: negativo, ecocardiograma de control mostró hipocinesia de ventrículo izquierdo, fracción de eyección de 45% sin otras alteraciones estructurales, asociado a elevación de biomarcadores miocárdicos. Presenta convulsión con encefalopatía posterior reversible observada en resonancia magnética nuclear. Ante no mejoría a la plasmaféresis se plantea como diagnóstico SHUa-e con manifestaciones renales, neurológicas, pulmonares y cardíacas, se indica inicio de ecilizumab 900 mg cada semana por 4 semanas en fase de inducción, 5 días posterior a primera dosis se observa mejoría de parámetros de función renal, lográndose retiro de terapia de remplazo renal y a los dieciocho días posteriores al inicio de Ecilizumab egreso sin signos de compromiso cardíaco, neurológico o renal.

Tabla 2: Resumen de paraclínicos de segundo caso

Paraclínicos	De ingreso	De egreso	Parámetros normales
Leucocitos	13.800	9.900	4.000-10.000 mm ³
Neutrófilos %	83	68	43-74%
Hemoglobina	4.3	8.9	11-16 gr/dl
Plaquetas	54.000 mm ³	291.000 mm ³	150.000-400.000mm ³

Volumen corpuscular medio	96	92	80-100 fl
Hemoglobina corpuscular media	30.9	30.8	27-32 pg
LDH	4.500	830	313- 618 u/l
AST	42	15	14-36 u/l
ALT	23	20	9-52 u/l
Creatinina	3.6	1.1	0.52 – 1.04 mg/dl
BUN	36	28	9-20 mg/dl
Proteinuria en 24 horas.	6.174		0-150 mg/24 horas
Coombs directo	Negativo		
Extendido de sangre perifrica	Morfologa de glbulos rojos normales		
Sedimento Urinario	Glbulos rojos dismrficos 30%		
Bilirrubina total	1.7	0.7	-
Bilirrubina indirecta	0,7	0.5	-
ANAs	Negativo		88 – 165 mg/dl
ANCAs	Negativo		14-44 mg/dl
Anti DNA	Negativo		-
C3	90		>5%
C4	35		20-30
Ac anti membrana basal glomerular	Negativo.		-
ADAMST 13	87%		0- 1,1 mg/dl
Haptoglobina	10		0-0.7 mg/dl
Ecografa hepatobiliar	Normal		-

LDH: lactato deshidrogenasa, AST: aspartato aminotransferasa, ALT: alanino aminotransferasa, BUN: nitrgeno urico, ANAs: anticuerpos antinucleares, ANCAs: anticuerpos anti citoplasma del neutrfilo.

Fuente: Elaboracin propia.

II. DISCUSIN

Dentro del sndrome hemoltico urmico se encuentran dos entidades: el tpico, caracterizado por ocurrir en el contexto de un evento infeccioso generalmente gastrointestinal asociado a toxina Shiga, y el atpico que no tiene como antecedente infeccin por enterobacterias, y que se debe a una activacin anmala del sistema del complemento (1). Se trata de una enfermedad de baja incidencia, siendo el primer caso reportado en nuestra institucin y departamento.

Es bien conocido que el embarazo es un estado proinflamatorio, y que parece ser el disparador de eventos en donde se involucra al sistema inmune, jugando un papel preponderante el sistema del complemento. Estudios han demostrado que las pacientes embarazadas tienen niveles mayores de C4d, C3a, sC5b-9, C3, C9 y Factor H comparado con mujeres no embarazadas. As mismo las mujeres con preeclampsia tienen niveles an mayores de protenas del complemento en comparacin de mujeres con embarazo de curso normal (6). Por lo que se considera que el embarazo puede comportarse como el factor desencadenante de enfermedades en donde interviene el sistema del complemento como la preeclampsia, sndrome de Hellp y SHUa, entre otros.

Cuando ingresaron las pacientes presentaron hipertensin arterial, anemia normoctica normocmica, lactato deshidrogenasa elevada, trombocitopenia moderada a severa y azoados elevados con requerimiento de terapia de reemplazo renal como se observa en las tablas 1 y 2. Lo que genera impresin diagnstica de sndrome de Hellp incompleto por la ausencia de elevacin de enzimas hepticas, pero dada la evolucin no caracterstica: persistencia de signos de hemolisis (lactato deshidrogenasa continuamente elevada, haptoglobina disminuida en una de las pacientes y presencia de esquistocitos en el extendido de sangre perifrica en una de ellas), requerimiento de transfusin, permanencia de trombocitopenia y falla renal), sin mejora a pesar de haberse desembarazado hace ms de una semana en ambos casos, se plantea diagnsticos diferenciales de MAT en el contexto de embarazo y postparto. Gupta propone sospechar SHUa asociado al embarazo ante la presencia de una de las siguientes: menos de 20 semanas de gestin, ms de 48 a 72 horas de postparto o historia familiar de SHUa (2). Nuestras pacientes cumplan con anemia microangioptica, trombocitopenia y haber estado en periodo postparto por ms de 72 horas. De aqu inicia la sospecha diagnstica.

Una vez planteada la posibilidad de MAT de etiologa diferente, y al descartarse causas como sepsis, malignidad, frmacos, enfermedad autoinmune (1), se llega a considerar prpura trombocitopnica trombtica (PTT) o SHUa-e. En una cohorte histrica se

encontr que la media de niveles de lactato deshidrogenasa en paciente con preeclampsia severa era de 581 u/l (7), mientras que en una serie de casos de pacientes con SHUa se encontr que la media de LDH era de 2953(8), en nuestras pacientes la media de LDH de ingreso fue 4381,5 lo que nos hizo encaminar el enfoque diagnstico hacia esta patologa. Cmo se ha planteado previamente, a estos diagnsticos se llegan por exclusin (1,4), descartndose PTT con la medicin de ADAMS 13, que en nuestros casos fueron mayor a 5% en cada paciente. Llegando as al diagnstico definitivo de SHUa.

El SHUa es una enfermedad de carcter multisistmico, en nuestros casos las pacientes presentaron compromiso neurolgico dado por cefalea, convulsin, encefalopata posterior reversible, compromiso pulmonar con hemoptisis y edema agudo de pulmn, una de nuestras pacientes presento signos de falla cardiaca aguda, signos de infarto agudo de miocardio con troponina I positiva, descenso de fraccin de eyeccin en el ecocardiograma, hipocinesia difusa del ventrculo izquierdo y requerimiento de soporte inotpico.

En correlacin se ha reportado que los sntomas neurolgicos son las manifestaciones extra renales que ms frecuentemente se presentan llegando a presentarse hasta en un 48% de los casos (9), mientras que en cuanto a complicaciones cardiovasculares estas ocurren en un 10% de los casos, teniendo estrecha relacin con el tipo de alteracin gentica identificado, fisiopatolgicamente explicado por una injuria producida sobre el endotelio y perdida de las propiedades antitrombticas logrando la formacin de trombos (10), esto explica en parte la mayora de complicaciones extra renales (cerebro, pulmn, ojo, piel).

Al realizar el diagnstico de SHUa, y no contar con eculizumab de forma inmediata, se dio inicio al tratamiento con plasmafresis de forma diaria, 5 das posterior a iniciada esta terapia no se obtuvo mejora hematolgica o renal. Esta intervencin hasta el 2011 fue la primera lnea de tratamiento, sin embargo se ha mostrado que en un 56% hay progreso a enfermedad renal crnica terminal, o muerte a un ao de seguimiento (11), estos datos corresponden con nuestras pacientes en donde no se obtuvo respuesta a este tratamiento.

Cuando se logr obtener eculizumab se dio inicio al tratamiento, con previa vacunacin contra meningococo. En nuestros casos debimos iniciar profilaxis antibitica con ampicilina 500 mg da ante la necesidad urgente de iniciar dicho tratamiento. Se inicia esquema de tratamiento con eculizumab de 900 mg por semana por 4 semanas como tratamiento de induccin, evaluando los siguientes parmetros para respuesta primaria o secundaria, segn recomendacin de estudios sobre seguridad y eficacia de eculizumab.

Respuesta primaria: conteo plaquetario >150.000 mm³, preservacin de la funcin renal (incremento de <25% en creatinina srica basal, y para respuesta secundaria: mejora de plaquetas y LDH, mejora en la funcin renal, estatus libre de MAT definido como (ausencia de descenso en 25% de conteo plaquetario, no necesidad de plasmafresis y no necesidad de hemodilisis) (5,12). Por lo anterior se puede observar que en nuestras pacientes se obtuvo una adecuada respuesta al tratamiento con eculizumab, logrando retirar la hemodilisis.

Esto es consistente con los hallazgos de Fakhouri (5), en donde lograron revertir la necesidad de hemodilisis en 83% de sus pacientes y 25% de estos tuvieron respuesta tras la primera semana de iniciada la medicacin, como en nuestros casos.

Cabe resaltar que SHUa es una enfermedad crnica de fondo gentico, principalmente por alteraciones en mecanismos reguladores de la va alterna del complemento, estudios han encontrado que ente un 41% a 60% de los pacientes se encuentran alteraciones genticas (4,13), estas mutaciones involucran el factor H (14-30%), protena cofactor de membrana (MCP), factor I, C3, factor B. Sin embargo el diagnstico es clnico, y aunque el estudio gentico es importante, no es imprescindible para realizar el diagnstico, ya que en un 59 a 40% de las pacientes no se encontraran dichas alteraciones.

III. CONCLUSIN

En el contexto de pacientes gestantes o que se encuentre en periodo posparto que debuten con hipertensin arterial asociado a alteraciones hematolgicas como anemia hemoltica de curso inusual es fundamental realizar diagnsticos diferenciales para microangiopata trombtica. Como lo son: prpura trombocitopnica trombtica (PTT) y sndrome hemoltico urmico atpico (SHUa) o sndrome hemoltico atpico asociado al embarazo (SHUa-e) (2).

El diagnostico de estas entidades son por exclusin, pero una vez realizado, el tratamiento puede mejorar notoriamente el curso de la enfermedad y prevenir evolucin a falla renal crnica.

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Electronic Fetal Monitoring of Low Risk Patients

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Introduction- Minimizing fetal morbidity during labor is one of the principal aims of intrapartum care. Electronic fetal heart rate monitoring (EFM) and intermittent auscultation are the known modalities of intrapartum fetal surveillance. Electronic fetal heart rate monitoring is routinely used at admission- the so-called Fetal Admission Test. If no fetal heart rate abnormalities are detected, continuous electronic monitoring is replaced by intermittent assessment for the remaining labor. The Admission test may help to identify those cases at risk in labor at the same time doing away with continuous monitoring. EFM at high risk is understandable, but at low-risk, does its advantages balance out the cost and increased incidence of operative delivery? This study is aimed at studying electronic fetal monitoring of low-risk patients in labor and its relation to perinatal outcome.

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Electronic Fetal Monitoring of Low Risk Patients

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& Dr. Parrru Singh [¥]

I. INTRODUCTION

Minimizing fetal morbidity during labor is one of the principal aims of intrapartum care. Electronic fetal heart rate monitoring (EFM) and intermittent auscultation are the known modalities of intrapartum fetal surveillance. Electronic fetal heart rate monitoring is routinely used at admission- the so-called Fetal Admission Test. If no fetal heart rate abnormalities are detected, continuous electronic monitoring is replaced by intermittent assessment for the remaining labor. The Admission test may help to identify those cases at risk in labor at the same time doing away with continuous monitoring. EFM at high risk is understandable, but at low-risk, does its advantages balance out the cost and increased incidence of operative delivery? This study is aimed at studying electronic fetal monitoring of low-risk patients in labor and its relation to perinatal outcome.

II. AIM

To assess the role of routine admission electronic fetal monitoring as a screening method in all low-risk pregnancies.

III. OBJECTIVES

- To find out the implication of EFM on the mode of delivery and perinatal outcome.
- To study the correlation of EFM with fetal outcomes.
- To assess perinatal outcomes in all these cases.

IV. MATERIALS AND METHODS

A cross-sectional study was conducted over a period of one year from November 2018 to October 2019 in all low-risk pregnant woman with the period of gestation 37-42 weeks attending labor room in early labor or pre labor phase in the Department of Obstetrics and Gynaecology of Rohilkhand Medical College and Hospital, Bareilly, U.P.

Inclusion criteria- Pregnant woman with period of gestation between 37-42 weeks.

Exclusion criteria- Pregnant women with high-risk pregnancy and obstetric complications like multiple pregnancies, malpresentation, placenta previa, pre-eclampsia, PIH (pregnancy-induced hypertension), antepartum eclampsia, oligohydramnios, IUGR (intra

uterine growth restriction), decreased fetal movements, PROM (pre mature rupture of membranes), third trimester bleeding, gestational DM (Diabetes Mellitus), Rh incompatibility, anemia, pregnant mothers whose dates were not confirmed and those who have irregular cycles.

V. RESULTS

The majority were in Category I (73.57%); Fetal distress was in 18.57%, while 14/140 required NICU admission. In Category II, III there was more fetal distress and operative intervention.

Out of 140 patients, 59 patients belonged to the age group of 20-24 years. Fifty-five patients belonged to 25 – 29 years of age group, and only rest belonged to 30 – 34 years of age group. The mean age was 25.35 ± 3.56 years. The maximum number of patients was multigravida (80 out of 140).

Out of 140 patients, 78 patients belonged to the gestational age of 39 – 40 weeks. Forty patients were of gestational age 37 – 38 weeks, and only 22 patients were of gestational age 41 – 42 weeks. One hundred eighteen patients were of gestational age 37-40 weeks. A maximum number of patients, i.e., 109 patients belonged to low socioeconomic class. 74 patients were residing in the urban areas and rest in the rural area.

Table 1: Correlation of EFM category with the mode of delivery along with the presence or absence of fetal distress

EFM Category	No.	Percentage (%)	Normal Delivery	Instrumental Delivery	LSCS	Normal Vaginal Delivery		Assisted Vaginal Instrumental Delivery		LSCS	
						With FD	Without FD	With FD	Without FD	With FD	Without FD
Category I	103	73.57	94 (91.26%)	1(0.97%)	8 (7.7%)	4(4.25%)	90(95.75%)	1(100%)	0(0%)	3(37.5%)	5(62.5.0%)
Category II	26	18.57	7 (26.9%)	2(7.7%)	17(65.4%)	1(14.3%)	6(85.7%)	1(50%)	1(50%)	8(47.06.5%)	9(52.94%)
Category III	11	7.86	2 (18.2%)	0 (0%)	9(81.82%)	1(50.0%)	1(50.0%)	0(0%)	0(0%)	7(77.78%)	2(22.22%)
Total	140	100.0	103	3	34	6	97	2	1	18	16

Table 2: Correlation of EFM Category with the color of the liquor

EFM Category	Clear Liquor	Thin MSL	Thick MSL
Category I	92(89.32%)	6(5.82%)	5(4.85%)
Category II	13(50.0%)	7(26.92%)	6(23.08%)
Category III	4(36.36%)	2(18.18%)	5(45.45%)
Total	109	15	16

Table 3: Correlation of EFM with Fetal Outcome

EFM cate.on:	Apgar score ≥ 7 at 5 minute	Apgar score < 7 at 5 minute	Need for intubation/ NICU admission	Abnormal behaviour	Neonatal death
Category I	99(96.12%)	4(188%)	4(3.88%)	0(0%)	0(0%)
Category II	21(80.77%)	5(19.23%)	5(19.23%)	0(0%)	0(0%)
Category III	6(54.5%)	5(45.45%)	5(45.45%)	0(0%)	0(0%)
Total	126	14	14	0	0

Table 4: Correlation of EFM with Fetal distress

EFM Category	Total	Fetal distress	Percentage(%)
Category I	103	8	7.77%
Category II	26	10	38.46%
Category III	11	8	72.72%
Total	140	26	18.57%

VI. DISCUSSION

One of the main concerns of Obstetricians is the early recognition of fetal distress during labor to avoid any adverse outcome. Fetal monitoring during labor identifies the fetuses at risk of hypoxic damage, so that appropriate intervention could be instituted to optimize perinatal outcome. EFM can detect hypoxia early, and unnecessary delay in intervention can be avoided. The EFM did at the time of admission to labor room in pre labor or early labor phase has two potential roles. It can be used as a screening test in early labor to detect compromised fetuses on admission and to select women in the need for continuous electronic fetal monitoring during labor. The present study was conducted in Obstetrics and Gynaecology Department, Rohilkhand Medical College and Hospital, Bareilly, U.P. from November 2018 to October 2019 over one year period on 140 low-risk patients admitted in early or prelabor phase. The different factors observed during the study are discussed and compared with other studies in the literature as below.

Most of the pregnant women (81.43%) in the present study were in the age group of 20 – 29 years. The mean age group in our study was 25.35 +/- 3.56 years. The present study correlates well with the study of Lohana RU, Khatri M, Hariharan C (2013)², Nikita V, Bhavna K (2014)³ and Gurung G, Rana A, Giri K (2006)⁴. Most of the patients (77.86 %) belonged to low socioeconomic class. Most of the patients in our study group belonged to urban area (52.86 %). The distribution of the patients in the present study is similar to the study done by Patel Nirav R, Kadikar Gunvant K, Kalathiya Bhumiya G, Bajaj Preeti (2015)⁵, M Shah

Jitesh, N Mehta Meghna, A Kongnathi Satyanarayan (2015)⁶.

Most of the patients (73.57 %) belonged to category I, and the least number of patients (7.86 %) belonged to category III. 18.57 % were in category II. The present study is similar to the study done by Gaikwad V, Puri M S, Pandey P (2015)⁷.

Out of 103 patients in Category I, 92 patients (89.32 %) had clear liquor, and only 10.67 % of the patients had meconium-stained liquor, out of which 4.85% of patients had thick meconium stained liquor. In category II, out of 26 patients, 13 patients (50 %) had clear liquor, and rest of 13(50%) patients had meconium-stained liquor, out of which 23.08 % of patients had thick meconium-stained liquor. However, in category III, 4 patients (36.36 %) patients had clear liquor and 7 patients (63.64%) had meconium-stained liquor, out of which 45.45% of patients had thick meconium-stained liquor. This was highly significant. The present study is in accordance with the study done by Shrestha P, Misha M, Shrestha S (2015)⁸, Gaikwad V, Puri M S, Pandey P (2015)⁷.

In category I, 99 neonates, i.e 96.12 % had Apgar score more than or equal to 7 at 5 minute and only 3.88 % of neonates had Apgar score less than 7 at 5 minute, and all of these neonates needed intubation and admission to NICU. In category II, 5 neonates (19.23%) had Apgar score less than 7 at 5 minute and all of these neonates needed intubation and were admitted to NICU. However, in category III, 5 neonates (45.45%) had Apgar score less than 7 at 5 minute and all of these neonates needed intubation and admission to NICU. None of the neonates in any of the three categories had abnormal behavior, and there were no

neonatal death. So, there were more neonates with poor Apgar score and who required intubation and admission in NICU in category II and category III. This was also highly significant. The present study is almost similar to the other study.^{5,8,9}

In category I, only 7.77% of neonates had fetal distress but in category II and category III, 38.46% and 72.72% of neonates had fetal distress, respectively. There was a highly significant difference in EFM categories with Fetal distress ($p=0.000$). The present study is similar to the study done by E Rama Devi, B Madhvi G, L P Reddy, P Anusha Rao (2015)¹⁰ which showed fetal distress in 7.73% of neonates in a normal group of Admission Test, 42.8 % in suspicious and 88.88% in the pathological group had fetal distress. The present study is also by the study done by Gaikwad V, Puri M S, Pandey P (2015)⁷ which showed fetal distress in 8.4 %, 48 % and 75 % of reactive, suspicious and pathological group of labor Admission Test. In category I, in our study, 91.26 % of patients underwent normal vaginal deliveries, and 7.77 % underwent cesarean section, and 0.97 % had instrumental deliveries.

Amongst these, 4.25 % of the vaginal normal delivery group had fetal distress, however 100% of the instrumental delivery group and 37.5 % of LSCS group had fetal distress. In category II, 14.3% of the normal vaginal delivery group had fetal distress; however, 50% of the instrumental delivery group and 47.06 % of LSCS group had fetal distress. In category III, the maximum number of patients underwent LSCS and of which 77.78 % of neonates had fetal distress. So, in category II and category III, there was more number of operative interventions for fetal distress. In the present study, findings of the type of delivery and fetal distress in category I, category II and also in category III of EFM correlated well with the study done by Nikita V, Bhavna K (2014)⁴ which reported that 1.4%, 50% and 33.3% of neonates had fetal distress in normal vaginal delivery group, instrumental delivery group, and LSCS group respectively in reactive group of labor Admission Test. In the equivocal group, 11.1%, 66.7%, and 62.5 % of neonates had fetal distress in normal vaginal delivery group, instrumental delivery group and LSCS group, respectively. In the ominous group, 66.7% of patients underwent LSCS and neonates of all those patients who underwent LSCS in ominous group had fetal distress.

In category I, 3.88% of patients underwent LSCS for fetal distress; another 3.88% underwent LSCS for other indications like nonprogress of labor (NPOL). The only one patient (0.97%) had instrumental delivery, and it was for fetal distress. In category II, 34.61% of patients underwent LSCS for fetal distress another 30.76% underwent LSCS for other indications like NPOL. 3.84% of patients had instrumental delivery for fetal distress and another 3.84% had instrumental delivery for NPOL. In category III, all the nine patients (81.82%) who underwent LSCS, was for fetal distress only. So, the rate

of LSCS for fetal distress was much higher for category II and category III patients. The present study is by the study done by E Rama Devi, B Madhvi G, L P Reddy, P Anusha Rao (2015)⁸ which showed that in normal group of Admission Test, 4.16% of patients had fetal distress as indication and 3.57% had other an indication for LSCS.

Performance of EFM with fetal outcome in the percentage-Our study showed high specificity and high Negative predictive value for the perinatal outcome. The present study is also by other studies done by Patel S et al. (2014)⁷, Lohana R U, Khatri M, Hariharan C (2013)².

VII. CONCLUSION

Electronic Fetal Monitoring is a simple, convenient, noninvasive and economical screening test in even low-risk patients and it can be used for the detection of intrapartum fetal distress during early hours of labor where pregnant women present in labor for the first time or where facilities of fetal scalp pH are not available in labor wards. The high specificity and high negative predictive value of the test shows its good reliability in prediction of perinatal outcome. But, in category II and III, there was also more number of instrumental vaginal delivery and cesarean section in which many neonates had Apgar score of more than 7. So, Electronic Fetal Monitoring could be backed with other tests such as fetal scalp pH sampling to detect fetal acidemia, and it may also decrease unnecessary operative deliveries.

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17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.



20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium through which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.



Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.



The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."



Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

THE ADMINISTRATION RULES

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BY GLOBAL JOURNALS

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	C-D	E-F
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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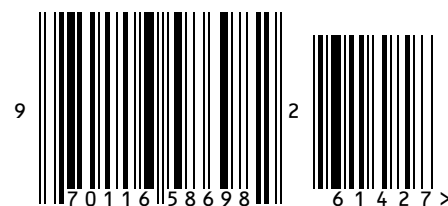
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