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IMPACT OF PHARMACISTS' HEALTH EDUCATIONAL INTERVENTION ON ANEMIA IN PREGNANCY IN RURAL SETTINGS IN KANO, NIGERIA

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ABSTRACT: The worsening trend of anemia in pregnancy continues to be a cause for concern in many developing countries. There is a need for synergy involving all health care professionals in order to reverse this alarming trend. The objective of this study was to assess the impact of pharmacists initiated health education intervention on anemia in pregnancy in the rural setting, in Kano, Nigeria. A total of 280 pregnant women attending an antenatal clinic, 140 each from the test and control sites, were recruited by a systematic sampling technique after signing a written informed consent form. A pre-tested interviewer-administered questionnaire was used to elicit baseline demographic and obstetric information. Baseline Packed Cell Volume (PCV) was done for each group, using the capillary technique. Health education intervention was administered to the test group only. Baseline and Post-intervention PCV were compared after 8 weeks using Chi-square statistics. A p-value of less than 0.05 was considered significant. The baseline prevalence of anemia was quite high, 31.4% and 39.3% for test and control groups respectively. There was a significant overall decrease in anemia prevalence among pregnant women in the test group from 31.4% to 15.2% compared with 39.3% to 31.4% in the control ($p < 0.05$). Primi gravidae and grand multiparous clients were less likely to be anaemic than the multiparous clients ($\chi2 = 25.4$, $p = 0.003$, $\alpha = 0.05$ and $\chi2 = 35.7$, $p = 0.0004$, $\alpha = 0.05$ respectively). Conclusively pharmacist-initiated educational intervention significantly reduced the prevalence of anemia among rural pregnant women.

INTRODUCTION: Anemia in pregnancy is a global public health problem [1-3]. The disease burden is highest in sub-Saharan Africa as a result of ignorance, poverty, and high levels of illiteracy [4-5]. It is estimated that nearly half of pregnant women in developing countries are anemic [6]. Anemia is directly or indirectly responsible for 20 to 30% of all maternal deaths [7-8].

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Despite strenuous efforts, the maternal mortality indices for Nigeria is still one of the worst in the world [9-10]. Several studies have been conducted in Nigeria on the prevalence and risk factors of anemia in pregnancy [11-16]. However, majority of these studies were done in the major urban centers and cities of Nigeria. No recent interventional studies have been reported in the rural areas of Northern Nigeria where there is a high prevalence of illiteracy and poverty.

Interventions to improve maternal health status during pregnancy consists mainly of health education through group talks delivered en masse to pregnant women at antenatal clinics. Usually, the environment is noisy, sitting arrangement is

poor and there are many distractions during these sessions. This has the potential to limit the benefits of such educational interventions. Therefore, reinforcing health education messages by the pharmacist as part of the dispensing process could complement efforts by the nursing staff and promote positive behavioral changes. Interventions at the level of the pharmacy provide an opportunity for personal, one on one interaction with a health professional devoid of all the drawbacks of mass education as obtains at the Antenatal clinic setting.

The objectives of this study were to determine baseline prevalence of anemia in control and test groups, to compare anemia prevalence in control and test groups after 8 weeks' intervention period and determine the impact of pharmacists' educational intervention on anemia in pregnancy in a rural setting in Kano State, Nigeria.

MATERIALS AND METHODS:

Study Setting: The study was carried out in the primary health care centers of Kumbotso and Babawa towns in Kumbutso and Gezawa Local Government Areas of Kano State, Nigeria. The test group was recruited from Kumbutoso while the control group was selected from clients at booking for ANC in Babawa Health Centre located at Gezawa LGA. Both study sites have similar ANC schedules and are staffed with doctors, pharmacists, pharmacy technicians, nurses, Community Health Extension Workers (CHEWs), records officers and other auxiliary staff members. Patient turnover is an average of 200 to 300 pregnant women per week at each of the two clinics. In this rural setting, there is a cultural preference for high parity with short intervals between pregnancies which may deplete iron stores and predispose women to anemia in subsequent pregnancies. The situation is compounded by skepticism and poor use of effective contraception techniques [13].

The study was a controlled prospective interventional study on anemia in pregnancy with patients attending Kumbotso Health Centre, as intervention group while the control population comprised of pregnant women attending Babawa Health Centre. The primary considerations for matching were not specific patient and clinical characteristics. Matching was done on the basis of proximity of the study sites, the similarity in demographics as well as medical resources available to both communities.

Inclusion Criteria / Exclusion Criteria: Patients who were not likely to deliver during the study period (at least 12 weeks) and who signed an informed consent form were recruited for the study while patients who were recently transfused or transfused for any reason during the study period and who had antepartum hemorrhage or any other cause of blood loss, as well as those who reported non adherence to routine medications, were excluded from the study. Adherence was determined by self- report. Also excluded were those with communication difficulties.

Sample Size Determination / Sampling Procedure: The formula for sample size for a comparison of two proportions was used [17]. This formula computes the minimum sample size required to demonstrate significant effect at a power of 0.80. The formula is:

$$N = 2 \cdot \frac{\left[z_{crit}\sqrt{2\,\bar{P}(1-\bar{P})} + z_{pwr}\sqrt{P_1(1-P_1)+P_2(1-P_2)}\right]^2}{D^2}$$

$$N = 2 \times [(1.96 \times 0.704) + (0.84 \times 0.7)]^2 / 0.01 = 774.6$$

Approx. 775

Adjusting for population less than 10000 using the formula

$$nf = N/ [1+ (P/N)]$$

Where, P = total population from which sample will be taken = average of 200 patients per week per center = 800 + 800 = 1600

nf = 775[1+ (1600/755)] = 253 plus 10% allowance for possible attrition.[18] = 280 Approx.

Therefore, the total sample size for the two groups is 280, which brings the sample size to 140 per group. A systematic sampling technique was used to recruit consenting pregnant women as they registered at the booking clinic. Sampling was conducted for a period of 4 weeks. Since the sample size determined for the study was 140 for each group, 35 patients were recruited for the study each week in cases and controls. With an estimated 150 eligible clients seen every week, every 4th eligible patient (*i.e.*, 150/35) was selected to participate in the study. The first patient is the one whose serial number was randomly selected from a

random number table. Subsequent patients were obtained by adding the sampling interval to the previous patient's serial number.

Data Collection: A pre-tested structured interviewer-administered questionnaire was adapted from a previous study [12] and translated into local language (Hausa). The questionnaire was divided into three parts; the first section contained questions pertaining to patient demographics, the second part elicited information about the previous obstetric history and the third section inquired about the history of the current pregnancy. Gestational age was estimated by the Last Menstrual Period (LMP) due to a lack of facilities like Ultrasound scan in the rural setting.

Determination of Packed Cell Volume (PCV): Finger prick blood samples of 25 microliters were collected from consenting patients using the heparinized capillary technique. Samples were centrifuged at 3000 rpm for 5 min. PCV was measured using a Hewkley microhematocrit reader [21]. For the purpose of this study, anemia in pregnancy was defined as a haematocrit of less than 30% [19-20]. The severity of anemia was classified as follows, mild (PCV 27% - 29%) moderate (PCV 21% - 26%) and severe (PCV below 21%).

The procedure was repeated post-intervention to determine the impact, if any, of the intervention.

Intervention: Pharmacists at both sites dispensed routine medications to pregnant women which included iron tablets and multivitamins. Only the usual care was provided to the control group. At the intervention site, a 2-day training on the delivery of health education messages was conducted for pharmacists. Training was facilitated by the lead researcher in conjunction with the midwives who were quite experienced in talking with pregnant women at the antenatal clinic.

The educational intervention was done using a written leaflet in English and translated verbatim into the local Hausa language. The leaflet covered four main areas, namely; the need to adhere to scheduled antenatal appointments and prescribed routine drugs, healthy eating habits, personal hygiene and environmental sanitation, and encouraging the use of Long Lasting Insecticide-treated Nets (LLIN). Leaflet based messages were reinforced by verbal reminders given at bi-weekly appointments for anemic patients in the intervention group. Reminders were provided by the pharmacist on duty as part of the dispensing process. Only subjects in the intervention group were given the prescribed health education.

Data Analysis: Completed questionnaires were scrutinized for errors, incompleteness or misclassification of data obtained during the interviews. All data were entered by two data entry clerks into separate Microsoft Excel Spreadsheets, and the two separate entries were compared to detect entry errors. The Statistical Package for Social Sciences (SPSS) version 16 was used for the data analysis [22]. Chi-square test was used for qualitative statistical analysis of proportions and t-tests for quantitative analysis of quantitative variables. A probability level of less than 0.05 was considered significant for all statistical calculations.

Outcome Variables: Primary outcome measures were pre- and post-intervention PCV values.

Ethical Consideration: Ethical approval for the study was obtained from the Ethical Committee of Aminu Kano Teaching Hospital, Nigeria (Approval no. NHREC/21/08/2008/AKTH/EC/1181) and Kano State Primary Health Care Board (Permit no PHCMB/ADM/13/12). Informed consent was obtained from prospective respondents prior to the commencement of the interviews.

RESULTS: Two subjects were transfused in the test group after the commencement of the study while one was transfused in the control group. In addition, two subjects were lost to follow up in the control group. Therefore, the number of subjects post-intervention was 138 and 137 for test and control groups respectively.

Patient Demographics: The age range of the 140 respondents from the test group was 14 to 45 years with a mean age of 24.97 ± 6.025. The majority of the subjects were Hausa-Fulani (n = 131, 93.6%) and all of them being of the Islamic faith. Almost all the subjects were married (n = 138, 98.6%) with one subject divorced and the other separated. Chi-Squared tests did not show any significant difference in demographic variables between the two groups. The socio-demographic characteristic of study participants is summarized in **Table 1**.

TABLE 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF TEST AND CONTROL GROUPS. N=140

Variable	Test (n=140) n (%)	Control (n=140) n (%)	χ^2	*p*-value
Age group (years)				
14 – 25	89 (63.6)	75 (53.6)		
26 – 37	45 (32.1)	55 (39.3)	3.2	*0.2*
38 – 49	6 (4.3)	10 (7.1)		
Ethnicity				
Hausa-Fulani	131 (93.6)	134 (95.7)	0.6	*0.4*
Others	9 (6.4)	6 (4.3)		
Occupation				
House wife	64 (45.7)	118 (84.3)	72	<0.0001
Petty trading	76 (54.3)	22 (15.7)		
Educational Status				
Up to secondary	99 (70.7)	87 (62.1)		
Tertiary	12 (8.6)	4 (2.9)	9.9	0.007
Non Formal	29 (20.7)	49 (35.0)		

Maternal Characteristics: The mean parity among pregnant women in the intervention group was 2.5 ± 1.982 with a mean birth interval of 2.13 ± 1.263 years compared with 2.9 ± 1.454 and 2.4 ± 0.849 years respectively for the control group. Details of maternal characteristics and utilization of antenatal services are shown in **Table 2**.

TABLE 2: BASELINE MATERNAL CHARACTERISTICS AND UTILIZATION OF ANTENATAL SERVICES. N=140

Variable	Test (n=140)	Control (n=140)	χ^2	*p*-value
Parity				
Primi	27 (19.3)	6 (4.3)		
1-2	47 (33.6)	55 (39.3)	19.2	0.0002
3-4	37 (26.4)	57 (40.7)		
5 and above	29(20.7)	22 (15.7)		
Gestational age(months)				
3	10 (7.1)	I(0.7)		
4	37 (26.4)	75 (53.6)		
5	54 (38.6)	52 (37.1)	72.0	<0.00003
6	39 (27.9)	12 (8.6)		
Interval between births				
Primi	27 (19.3)	6 (4.3)		
<1 year	14 (10.0)	15 (10.7)		
1 <2years	15 (10.7)	35 (25.0)	25.1	<0.00004
2-4 years	78 (55.7)	83 (59.3)		
>4 years	6 (4.3)	1 (0.7)		
Previous antenatal history				
Attended	103 (73.6)	87 (62.1)		
Not attended	37 (26.4)	53 (37.9)	4.2	0.04
Mode of last child delivery				
Home	51 (36.4)	79 (56.4)		
Hospital	38 (27.1)	2(1.4)	72	<0.00003
Others	51 (36.4)	59(42.1)		
Problems encountered during last delivery				
No problems	96 (68.6)	90 (64.3)		
Still birth	15 (10.7)	8(5.7)		
Miscarriage	17 (12.1)	25(17.9)	4.8	0.31
PPH	7 (5.0)	9(6.4)		
Others	5 (3.6)	8(5.7)		
Use of Long -lasting insecticide treated nets				
Yes	100 (71.4)	91 (65.0)		
No	40 (28.6)	49(35.0)	1.33	0.25
Episode of fever				
Yes	50 (35.7)	100(71.4)		
No	90 (64.3)	40(28.6)	72	<0.00002
Use of IPT				
Yes	28 (20.0)	61(43.6)		
No	112 (80.0)	79(56.4)	17.9	<0.00002

LLIN=Long -lasting insecticide-treated nets; IPT= Intermittent Preventive Therapy

The prevalence of anemia among pregnant women stratified by maternal characteristics is shown in **Table 3**.

TABLE 3: PREVALENCE OF ANEMIA IN PREGNANCY BY MATERNAL CHARACTERISTICS FOR TEST AND CONTROL GROUPS AT BASELINE. N=140

Characteristic	Test (n=140) n (%)		Control (n=140) n (%)		χ^2	*p*-value
	Not-anaemic	Anaemic	Not-anaemic	Anaemic		
Age Group (Years)						
14 – 29	79(72.5)	30(27.5)	68(61.8)	42(38.2)		
30 – 45	17(54.8)	14(45.2)	17(56.7)	13(43.3)	3.8	*0.300*
Parity						
Primi	21(77.8)	6(22.2)	4(66.7)	2(33.3)		
1 – 2	35(74.5)	12(25.5)	37(67.3)	18(32.7)		
3 – 4	22(59.5)	15(40.5)	32(56.1)	25(43.9)		
5 and above	18(62.1)	11(37.9)	12(54.5)	10(45.5)	25.4	0.003
Interval between births						
Primi	21(77.8)	6(22.2)	4(66.7)	2(33.3)		
<1 year	8(57.1)	6(42.9)	13(86.7)	2(13.3)		
1 <2years	9(60.0)	6(40.0)	22(62.9)	13(37.1)		
2-4 years	55(70.5)	23(29.5)	46(55.4)	37(44.6)		
>4 years	3(50.0)	3(50.0)	0(0.0)	1(100.0)	35.7	0.0004
Previous antenatal history						
Attended	66(64.1)	37(35.9)	52(59.8)	35(40.2)		
Not Attended	30(81.1)	7(18.9)	33(62.3)	20(37.7)	7.5	0.060
Problems encountered during last delivery						
No problems	66(68.8)	30(31.3)	52(57.8)	38(42.2)		
Still birth	4(26.7)	11(73.3)	3(37.5)	5(62.5)		
Miscarriage	5(29.4)	12(70.6)	16(64.0)	9(36.0)	43.4	<0.0002
PPH	3(37.5)	5(62.5)	4(44.4)	5(55.6)		
Use of LLIN						
Yes	69(69.0)	31(31.0)	55(60.4)	36(39.6)		
No	27(67.5)	13(32.5)	30(61.2)	19(38.8)	1.4	0.710
Episode of fever						
Yes	22(44.0)	28(56.0)	64(64.0)	36(36.0)		
No	68(75.6)	22(24.4)	21(52.5)	19(47.5)	72	<0.00008
Use of IPT						
Yes	18(64.3)	10(35.7)	38(62.3)	23(37.7)		
No	78(69.6)	34(30.4)	47(59.5)	32(40.5)	18.3	<0.0004

LLIN=Long -lasting insecticide-treated nets; IPT= Intermittent Preventive Therapy.

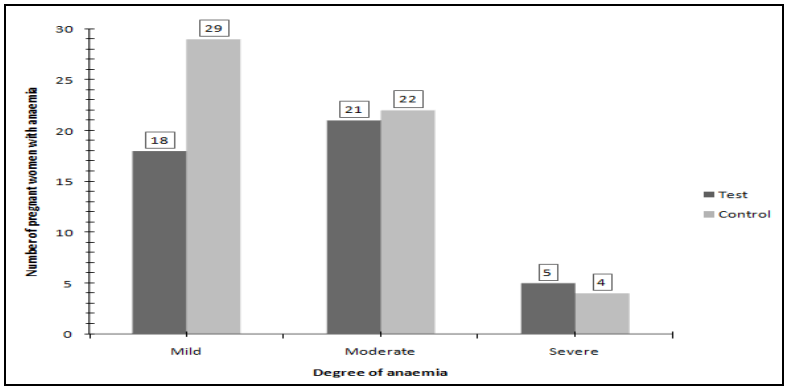

FIG. 1: DEGREE OF ANEMIA FOR TEST AND CONTROL GROUPS AT BASELINE

Degree of Anemia at Baseline among Clients in Test and Control Groups: At baseline, 96% of the test subjects had normal PCV while 12.9%, 15.0% and 3.6% had mild, moderate and severe anemia respectively. For the control group, 85% had normal PCV and 20.7%, 15.7% and 2.9% had mild, moderate and severe anemia respectively, **Fig. 1**.

Outcome of Pharmacist' Intervention: Prevalence of anemia (PCV<30%) at baseline was 44/140 (31.4%) and 55/140 (39.3%) for intervention and control groups respectively while PCV values at baseline were 31.1 ± 5.10 and 30.3 ± 4.30 for test and control groups respectively.

Following educational intervention, prevalence of anemia was significantly reduced in intervention compared to control group, 21/138 (15.2%) and 43/137 (31.4%) $\chi^2 = 10.07$, $p = 0.002$, $\alpha = 0.05$. while PCV values were increased and ranged from 26% to 39% (mean 34.2% ± 3.50) and 23% to 40% (32.8 ± 4.50) for test and control groups respectively, **Table 4**.

TABLE 4: DIFFERENCE BETWEEN PCVs OF TEST AND CONTROL GROUPS AT BASELINE AND POST INTERVENTION

	BASELINE			POST INTERVENTION*		
	Test gp N = 140 N (%)	Control N = 140 N (%)	Difference between test and control groups	Test gp N = 138 N (%)	Control N = 137 N (%)	Difference between test and control groups
Not Anaemic	96 (68.6)	85 (60.7)	11	117 (84.8)	94 (68.0)	23
Anaemic	44 (31.4)	55(39.3)	-9	21 (15.2)	43 (31.4)	-22

Anemia = PCV<30%, * $\chi^2 = 10.07$, $p = 0.002$, $\alpha = 0.05$

DISCUSSION:

Socio-demographic Characteristics: The study population in both groups were mostly younger women as compared to other studies reported in Ibadan [5] Lagos [12] Benin City [23] and Kaduna [11]. Also, almost all the subjects for the study were married. This is not surprising as there is a cultural preference for early marriage in northern Nigeria. Nwizu and his colleagues found a predominance of married persons in a similar study carried out in Kano [13], perhaps because married women are more likely to be encouraged to attend antenatal care.

Prevalence and Degree Anemia: Even though the WHO recommends anemia with a cut-off of PCV <33%, this study used a more pragmatic cut-off of PCV <30% since it has been argued that pregnant women in this setting can tolerate lower levels of anemia and still remain quite stable [19-20]. This gave a baseline prevalence rate of 31.4% and 39.3% for the test and control group respectively. Prevalence and the degree of anemia observed in this study were comparable with those found in similar previous studies conducted in Nigeria. For example, prevalence rates of 17% have been reported in Kano by Nwizu and colleagues in 2011 [13], 35.3% in Lagos [12] 20.7% in Benin [23], 32.8% in Oyo [24] and 40.4% in Enugu [25]. However, rates higher than those obtained in this study were observed in studies conducted in Ilorin [26], Port Harcourt, Rivers State [27] Kenya [28] and Libya [29] (using WHO cut-off). These findings are understandable as the World Health Organization estimates that about 57.1% of pregnant women in the tropics of Africa and almost 60% in Nigeria are anemic at booking [30, 31].

Intervention: Pharmacist initiated educational intervention resulted in a statistically significant reduction in the prevalence of anemia among pregnant women in the test group compared to the control. 15.2% *vs*. 31.4%, $\chi^2 = 10.07$, $p = 0.002$. A similar controlled interventional study in two antenatal centers in Tanzania involving malaria chemoprophylaxis, free hematinic and community health education achieved a reduction in anemia prevalence among the cases from 60% at booking to 47% [32]. Another interventional study in rural Ghana which consisted of comprehensive treatment for severely anemic women, found that the mean PCV in the severely anemic group decreased by 9.6% [33]. In a 6-month retrospective, longitudinal cohort study involving 101 anemic patients with chronic kidney disease, significantly higher levels of adherence to guidelines for hemoglobin monitoring (32.3% *vs*. 14.3%, P = 0.049) and iron monitoring (61.3% *vs*. 30.0%, *P* = 0.005) as well as lower medication utilization rates were observed in test group compared to patients receiving usual care [34].

Another prospective cross-sectional interventional study designed to assess adherence to oral iron supplements among pregnant women showed that the mean adherence rate and hemoglobin levels were significantly higher in the intervention group at the fourth visit following the pharmacist's intervention. The intervention consisted of free iron supplements along with routine counseling [35]. Pharmacists could also complement the activities of physicians and other health care providers in the management of anemia by carrying out interventions among pregnant women designed to optimize the absorption of iron. This would include identifying and reducing drug interactions with oral iron, identifying medications that can exacerbate the anemia and making dietary recommendations to pregnant women [36].

Factors Associated with Anemia in Pregnancy: Predictors of anemia in pregnancy include age, parity, birth interval and post-natal complications. In this study, increasing age was found to be associated with anemia in pregnancy. Even though we could not demonstrate a statistically significant association ($\chi^2 = 3.8$, $p = 0.3$), the prevalence of anemia was highest in the 30-45 years age group. This trend agrees with the findings in Kano [11] and Benin [23] but differs from the findings of a study conducted in Lagos [12].

Prim gravid and grand multiparous clients in this study were less likely to have anemia compared to clients that are multiparous (para 1 to 4). ($\chi^2 = 25.4$, $p = 0.003$, and $\chi^2 = 35.7$, $p = 0.0004$, respectively). This could be explained by the fact that the latter group's situation could be confounded by short birth interval, leading to depleted iron stores or maternal depletion syndrome and agrees with other reported findings [37-38]. Other workers however, found the highest anemia prevalence among prim gravid clients [12].

Episodes of febrile illness among pregnant women in this study were shown to be associated with anemia in pregnancy ($\chi^2 = 72$, p = <0.00008), Similar findings have been reported by other workers [12, 39]. Although lack of use of Long Lasting Insecticide-treated Nets (LLIN) and Intermittent Preventive Therapy (IPT) for malaria was not shown to be associated with anemia in this study ($\chi^2 = 1.4$, p = 0.71, $\alpha = 0.05$ and $\chi^2 = 18.3$, p = 0.0004, respectively), they have been reported to be strongly associated with anemia in pregnancy in malaria-endemic areas [12, 40].

This study had several limitations. Being a facility-based study, the effects of selection bias could limit the generalization of the findings to the whole populace as most rural pregnant women do not attend formal health care facilities. Also even though both sites had similar characteristics, subjects in the test and control groups were not matched on the basis of individual clinical characteristics. Other possible causes of anemia such as parasitemia and hookworm infestation were not excluded. Another limitation was that gestational age was restricted to the second trimester only. Also self- reported adherence to routine medications was determined by self- report. A validated instrument would have been more reliable.

CONCLUSION: Prevalence of anemia in pregnancy among rural pregnant women attending antenatal care at primary health centers in Kano, Nigeria was high. Anemia in pregnancy was found to be significantly associated with parity (especially multiparous women but not prim gravidae and grand multiparous women), the interval between births, previous postnatal complications, episodes of febrile illness and the utilization of malaria Intermittent Preventive Therapy (IPT). Pharmacist initiated educational intervention at the point of dispensing routine medication significantly reduced the prevalence of anemia among rural pregnant women

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