

THE INFLUENCE OF URINARY TRACT INFECTION IN PREGNANCY ON ANAEMIA, TOXAEMIA AND GROWTH AND DEVELOPMENT OF THE FETUS*

by

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The Urinary tract infection in pregnancy may exist in symptomatic or asymptomatic form. Bacteriuria in pregnancy referring to the presence of more than 100,000 organisms per ml. of urine has received a great deal of attention in recent time. The asymptomatic bacteriuria in pregnancy may represent a stage in a continuous process eventually reaching severe renal damage. The present study evaluates the extent to which bacteriuria in pregnancy is responsible for certain complications in pregnancy, namely anaemia, toxæmia and problems of growth and development of the foetus measured in the present study by the crude indicator of birth weight.

Material and Method

The study was in progress since 1965 and a total of 1,000 pregnant women in the age group between 15 to 40 years and above have been screened. A careful

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clinical history was obtained. The procedure of how to discard the initial stream in the toilet before collecting the uninterrupted middle part was explained to the women. After preliminary cleansing of the vulva with sterile saline, 'a clean catch' of mid-stream urine was collected in a way similar to the method adopted by Turner (1961) and McGeachie and Kennedy (1963).

The urine samples were examined within 15 minutes and in cases of unavoidable delay, it was refrigerated at 4°C. immediately. The urine sample was divided into two parts, one for cell count and chemical examination for proteinuria and the other for the bacteriological studies.

Bacteriological Studies

A serial ten fold dilution of the urine was made in sterile normal saline and a viable colony count of the organisms was performed on each plate as early as possible. The Mac Conkey's and blood agar plate were used for inoculation and subsequent incubation at 37°C. All these plates are previously dried for two hours for better and prompt absorption of the inoculum. All these plates were kept under incubation at 37°C. for 24 hours for surface viable count. The organisms were isolated by routine methods.

The pregnant women having more than 100000 organisms per ml. of urine were considered as bacteriurics. The examination of the urine was repeated whenever necessary. Both, bacteriurics and non-bacteriurics, were followed up during the whole course of pregnancy and until the end of 6 weeks after delivery. Unfortunately, there has been a considerable number of drop outs and irregular attendances during the follow up and for comparative evaluation a group of 600 consecutive non-bacteriuric women who regularly presented for the planned follow up served as controls.

Results

Out of a total number of 1,000 women screened, 102 were found to be bacteriurics in the early months of pregnancy, giving an overall incidence of 10.2 per cent. Of these 102 women with bacteriuria, 80 had no symptom suggestive of urinary tract infection and 22 had some symptom indicative of underlying urinary tract infection. Thus, the incidence of asymptomatic bacteriuria was 8 per cent and that of symptomatic one was 2.2 per cent respectively.

Anaemia

Table I reveals the frequency of anaemia in bacteriurics and non-bacteriurics during current pregnancy. During pregnancy haemoglobin level of less than 10 G. per 100 ml. of blood was considered as the criterion for anaemia. Haemoglobin was determined by Sahli's method. Sixty-five of the 80 (81.2 per cent) bacteriurics had anaemia, whereas 130 of the 600 antenatal non-bacteriurics were anaemic. Iron deficiency hypochromic anaemia was the common type of anaemia in the bacteriurics.

TABLE I
Incidence of Anaemia in 80 Bacteriurics and 600 Non-bacteriurics

	Bacteriurics		Non-Bacteriurics	
	No.	%	No.	%
Anaemic	65	81.2%	130	45%
Non-anaemic	15	18.8%	270	55%
Total	80	100%	600	100%

Pre-Eclamptic Toxaemia and Hypertension

Table II shows the frequency of pre-eclamptic toxaemia and hypertension in the asymptomatic bacteriurics compared to the control group of non-bacteriurics. Presence of any two of the following, rise of blood pressure above 140/90 m.m. Hg., oedema and albuminuria was considered as evidence of pre-eclamptic toxaemia in pregnant women after 20 weeks of pregnancy. A pressure above 140/90 m.m. Hg. in the absence of oedema or albuminuria was taken as evidence of hypertension. By using the above criterion, out of 80 asymptomatic bacteriurics, 3 (3.7) per cent had pre-eclamptic toxaemia, whereas in the control group of non-bacteriurics, 90 out of 600 (15 per cent) women had evidence of pre-eclamptic toxaemia during the same period. With regard to hypertension, out of 80 asymptomatic bacteriurics, 4 had hypertension (5 per cent) and in the non-bacteriuric

TABLE II
Incidence of Pre-eclamptic and Hypertension in 80 Bacteriurics and 600 Non-bacteriurics

	Bacteriurics		Non-Bacteriurics	
	No.	%	No.	%
Toxaemia	3	3.7%	90	15%
Hypertension	4	5%	79	13.1%

group, 79 out of 600 (13.1 per cent) had hypertension.

Nature of Labour

Table III indicates the outcome of pregnancies in the bacteriurics and non-bacteriurics. Vaginal delivery at full term occurred in 48 of the 80 (60 per cent) bacteriurics and 33 of the 600 (55.2 per cent) non-bacteriurics. Premature labour set in between 35 to 37 weeks in 15 of the 80 (18.8 per cent) bacteriurics and 58 of the 600 (9.6 per cent) of the non-bacteriurics. Labour was induced in 13 of the 80 bacteriurics (16.2 per cent); toxæmia in 3, hypertension in 4 and antepartum hæmorrhage in 6 were the reasons for induction. Out of the 600 non-bacteriurics, 190 (31.7 per cent) needed induction (90 for toxæmia, 79 for hypertension and 21 for antepartum hæmorrhage). Caesarean section was necessary for obstetric reasons, e.g. foetal distress, prolonged labour and cephalopelvic disproportion in 4 of the 80 (5 per cent) bacteriurics and

21 of the 600 (3.5 per cent) non-bacteriurics.

Birth Weight of Babies Born of 48 Bacteriurics and 331 Non-Bacteriurics Delivered at Full Term Pregnancy

Table IV represents the result of comparative study of the birth weight of the babies delivered at full term from 48 bacteriurics and 331 non-bacteriuric mothers. Fourteen (29 per cent) had delivered premature babies weighing less than 2,500 gms. and 52 of the 331 non-bacteriurics mothers (15.4 per cent) had given birth to premature babies weighing less than 2500 gms.

Discussion

The result shows that 81.2 per cent of the bacteriurics were anaemic and 45 per cent of the non-bacteriurics were also anaemic. This apparently increased incidence of anaemia even in the non-bacteriurics could be explained by low socio-economic status and nutritional factors operating

TABLE III
Nature of Labour in 80 Asymptomatic Bacteriurics and 600 Non-bacteriurics

Nature of delivery	Bacteriurics		Non-Bacteriurics	
	No.	%	No.	%
Full term vaginal delivery	48	60%	331	55.2%
Premature labour*	15	18.8%	58	9.6%
Induction of labour	13	16.2%	190	31.7%
Caesarean section	4	5.0%	21	3.5%
Total	80		600	100%

TABLE IV
Comparative Study of the Birth Weight of Babies Born of Asymptomatic (48) Bacteriuric and 331 Non-bacteriurics at Full Term Pregnancy

Birth Weight	Bacteriurics		Non-Bacteriurics	
	No.	%	No.	%
Premature babies (under 2,500 gms)	14	29%	52	15.4%

in the majority of the out patients attending our hospital.

The striking increase in the incidence of anaemia (8.12 per cent) in the bacteriurics seems indicative of a definite cause and effect relationship between bacteriuria and anaemia. In this respect it might be postulated that although the physiopathology of kidney in the causation of anaemia is not well understood, future research in this subject may bring out some tangible evidence to account for it. Anaemia was found to be markedly increased among women with asymptomatic bacteriuria by many workers, the increase affecting the incidence of both normochromic and hypochromic anaemias, but the mechanism of the anaemia associated with renal infection in pregnancy is obscure.

Giles and Brown (1962) reported a high rate off infection of the renal tract in anaemic patients who failed to respond to routine administration of iron and folic acid, but found that these patients improved after the eradication of bacteriuria. Kincaid-Smith *et al*, (1964) have observed the incidence of anaemia to be significantly higher in the bacteriuric pregnant women.

Iron deficiency anaemia was twice as common in the bacteriuric group of mothers as in the non-bacteriuric mothers (Patrick, 1967). Dey *et al*, (1969) reported that anaemia was common in bacteriuric women, 30 per cent as opposed to 17.6 per cent in non-bacteriurics. Worn (1970) found anaemia to be markedly increased among women with asymptomatic bacteriuria.

Only 3.7 per cent of the bacteriurics had toxemia of pregnancy, whereas 15 per cent of the women from the control group had evidence of toxemia. From this it would appear that the bacteriurics are

not specially prone to toxemias of pregnancy.

When only hypertension was considered, it was seen that the incidence of hypertension in the bacteriurics and non-bacteriurics was 5 and 13.1 per cent respectively (Table II). There is a great deal of controversy between the association of toxemia of pregnancy and bacteriuria. Peters *et al*, (1936) found an association between pyelitis and toxemia of pregnancy and had result, which was in agreement with the works of Finnerty *et al*, (1961), Kincaid-Smith and Bullen (1965) and several other workers. Kass (1962) reported an increased incidence of eclampsia and suggested that it could be attributed etiologically to the effect of untreated asymptomatic bacteriuria and hypertension. Giles and Brown (1962) also found increased incidence of pre-eclamptic toxemia in the bacteriurics. Felding (1965) conducted a retrospective study of the pregnancies and deliveries of 259 women who had a history of urinary infections. Compared to acute urinary infection, the pregnancies in patients who had suffered from pyelonephritis was much worse. Severe pre-eclamptic toxemia occurred in 14.7 per cent of women having had pyelonephritis in the past and only 2.7 per cent of women having had acute urinary infection in the past. Patrick (1967), however, noted strikingly the absence of pre-eclamptic toxemia and hypertension in the bacteriuric patients. Dey *et al*, (1969) found pre-eclamptic toxemia in bacteriuric women approximately double than in non-bacteriuric.

An attempt has been made in the present study to see if bacteriurics are more prone to have premature labour and low birth weight babies (Tables III & IV). There was premature onset of labour between 35 to 37 weeks in 15 of the 80 (18.8

per cent) bacteriurics and in 58 of the 600 (9.6 per cent) non-bacteriurics (Table III). A comparative study of the birth weight of the babies born of the bacteriurics and non-bacteriurics at full term has also been made and the observation is quite significant (Table IV). It is evident that 29 per cent of the bacteriurics had given birth to premature babies weighing less than 2500 gms. as compared to 15.4 per cent non-bacteriurics during the same period of pregnancy. This observation clearly suggests that although the period of pregnancy remained the same, full term, compared to the non-bacteriurics, the incidence of low birth weight babies was quite high in the bacteriurics. The exact cause for this growth retardation is not well understood. The possibility of disturbed folic acid metabolism, essential for foetal growth as a causative factor in the bacteriurics has been mentioned by some observers. Kass (1962), Henderson, *et al.*, (1962) and Kincaid-Smith and Bullen (1965) have all found an increased prematurity rate and foetal mortality to be associated with bacteriuria in pregnancy. Martin *et al.*, (1967) report that bacteriuria in pregnancy significantly reduced the serum folate levels and since a good correlation was found between abnormal folic acid clearance test during pregnancy and the rate of growth of the foetus and uterus (Chanarin *et al.*, 1959) it might be expected that bacteriuria consequently lead to low birth weight and prematurity. Kincaid-Smith and Bullen (1965) believe that the high rate of perinatal loss and prematurity in the bacteriurics is due to some basic renal impairment which in turn predisposed them to bacteriuria. On the other hand, in the series presented by Patrick (1957) there appeared to be factors producing recurrent loss in individual non-bacteriuric

patients. Whalley (1967) stated that opinion differed on the question of the rate of prematurity and on efficiency of successful treatment of bacteriuria in the prevention of prematurity. A large well designed study to establish finally the presence or absence of an association between bacteriuria and prematurity and the value of successful chemotherapy in the prevention of prematurity has yet to be published." Condie *et al.*, (1968) maintain, "there also seem to be an increased danger of foetal mortality and premature birth in bacteriuric women, although further investigation of this problem is recognised". The important question whether treatment reduces foetal mortality and premature birth remains to be established.

Summary

This study has shown the incidence of asymptomatic and symptomatic bacteriuria are 8 and 2.2 per cent in the early months of pregnancy. During follow up in current pregnancy, iron deficiency hypochromic anaemia was more frequent in the bacteriurics. Bacteriurics did not show any increased incidence of toxæmia or hypertension. Premature labour and low birth weight babies were more common in the bacteriurics.

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