

## PREGNANCY ASSOCIATED WITH DIABETES.

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A STUDY of the literature of pregnancy associated with diabetes is very interesting. The rarity of this condition, as shown by the few cases tabulated, gives but a meager working basis to draw conclusions that will be of much value.

In general practice a case of diabetes is looked upon as serious, in surgery a complication which often forbids even a simple operation, and in obstetrics (if we accept the views as expressed by that master—Mathews Duncan), we are dealing with a grave complication.

Cadges<sup>1</sup> interesting report of the death of Dr. Hughes Bennett from exhaustion and sudden collapse the tenth day following an operation—lateral lithotomy for stone in the bladder—shows how rapidly a fatal termination may ensue when diabetes complicates a surgical operation.

Griesinger<sup>2</sup> calls attention to the fact that fatal issues may be very perplexing and misunderstood, if the diabetes is intermittent and happens to be absent at the time of the fatal intercurrent disease.

In McBride's paper<sup>3</sup> "on the significance of small quantities of sugar in the urine," he states that sugar has been found in connection with phthisis, pleurisy, cardiac disease, cerebral hemorrhage, certain psychoses and follows shock. If sweets are taken freely, especially upon an empty stomach, glycosuria is very apt to be produced. Hence, when an individual who did not present the ordinary symptoms of diabetes consulted him and he found sugar but not a high specific gravity, he expected, as a rule, a quick recovery under proper diet.

Blot<sup>4</sup> in 1856 first drew attention to the presence of sugar in small quantities in the urine of puerperal women, and says that it is a physiological occurrence. He also states that the quantity of sugar is in direct relation to the activity of the mammary glands.

Kiester<sup>4</sup> in 1857 confirms as to the presence of sugar, but affirms that if the lacteal secretions be hindered, the sugar increases instead of diminishes, whilst in those women who have much milk, and whose baby thrives, only traces of sugar are found in the urine.

Brücke<sup>4</sup> in 1858 says that sugar in the urine is physiological in nursing women, and in healthy individuals.

Ivanhoff<sup>4</sup> says that the glycosuria of pregnant and puerperal women is not constant, as Blot states, but nevertheless it is often met with.

De Sinyt<sup>4</sup> in 1873 investigating the subject at length stated, that at the third or fourth day after delivery, he always found sugar in the urine.

Spiegelberg<sup>4</sup> mentions that the urine is frequently saccharine, that the sugar is in the form of lactose and as a rule contemporaneous with the establishment of lactation, the quantity being generally in proportion to the quantity of milk. He regards the condition as one of resorption diabetes.

Hempel,<sup>4</sup> 1874-1875, from an analysis of twelve cases concluded that sugar was present at some period during the puerperium, the greatest quantity noted being 1.6 per cent., and in these cases the breasts were enormously distended.

Kaltenbach,<sup>4</sup> while corroborating the works of previous writers, at the same time noted the relation of sugar in the urine to changes in the mammary glands.

Hofmeister<sup>4</sup> in 1878 showed that the sugar found in the urine of suckling women possessed all of the characters of milk sugar.

W. W. Jaggard<sup>5</sup> is authority for the statement that Tarnier rejected the notion of physiological resorption of sugar, and ascribes the glycosuria of pregnancy to hepatic changes.

From the above opinions as given by various investigators, it is essential that in grouping our cases we draw a distinct line between sugar in the urine due to lactose and a diabetic urine.

The appearance of sugar in the urine of pregnant women, only discovered in cases where a systematic examination of the urine is made before and after parturition, is of little importance if the patient is otherwise symptomless. Yet even if it is classified as a physiological fact and of little importance, it puts the competent observer on his guard, and any pregnant woman with sugar in her urine needs careful watching.

When, however, large quantities of urine are being passed, heavily loaded with sugar, and other symptoms of diabetes are

present, an entirely different case is before us for study, and we have what Duncan considered a grave condition.

Partridge<sup>6</sup> defines puerperal diabetes as diabetes developing during pregnancy, lasting through a considerable part or the whole of gestation, and disappearing to recur in succeeding pregnancies.

McCann and Turner<sup>4</sup> in their investigation of a series of 100 cases, found that lactose was present in every case, but the quantity naturally varies at different periods and in different individuals. Regarding the date of appearance of lactose, in 29 per cent. of cases, the sugar was present on the day of labor. The question as to whether mental anxiety at this time would cause a temporary glycosuria, is as yet unanswered.

The late appearance of sugar in the urine in some cases, even on the fourth or fifth day, may be explained by lactation being delayed.

The theory now accepted is that, the mammary glands being in a state of great activity on the third and fourth day of the puerperium, milk rapidly forms, the breasts become distended, milk sugar is absorbed into the blood owing to the excessive production or diminished outflow of milk, and this excess of milk-sugar is excreted in the urine, and thus is formed the largest amount on the fourth or fifth day. The more distended the breasts, the lesser the outflow of milk, and hence a greater amount of sugar appears in the urine than if there was no impediment to its flow.

In summing up their results McCann and Turner<sup>4</sup> came to the following conclusions:

1. That the sugar present in the urine of women during lactation is milk sugar. Glucose may also be found.
2. That in the majority of cases, the largest amount occurs on the fourth or fifth day of the puerperium.
3. That sugar is present at some period in every case.
4. That the quantity depends on: (1) The condition of the breasts. (2) The quantity and quality of the milk. (3) The suckling of the child. Out of 100 cases, the average quantity found was .35 per cent., that is 1½ grains per ounce.
5. That when lactation is diminished or suppressed, the amount of sugar diminishes or disappears.
6. That when the production and exhaustion of the milk are equal, the amount of sugar is very small.

Willson<sup>7</sup> made a series of nearly 1,800 urinalyses in two years, and the majority of specimens examined were from pregnant women. Of this number only a small percentage—22 per cent.—

were entirely free from albumin and sugar, while in no case in which glucose was noted was albumin absent. When glucose appeared in the urine of a subject known to have previously not shown glycosuria, the occurrence, as a rule, took place at some time between the beginning and the end of the last month of pregnancy. Occasionally there was a trace of glucose throughout the pregnancy, this often disappearing completely after the birth of the child.

Payer<sup>8</sup> has shown that women are less tolerant of sugar during pregnancy than at other times, as he and McBride produced alimentary glycosuria in 80 per cent. of his patients by increasing the amount of sugar ingested.

While sugar in the urine is looked upon as a physiological factor, if diabetes supervenes, all agree that the case becomes serious, that it is dangerous to the woman and perplexing to the attending physician.

Symptoms which generally attract our attention to diabetes are three—thirst, polyuria and pruritus vulvæ. Such were the symptoms in the case I wish to report:

Mrs. G., age 35, 5 feet 7 inches in height, weight 150 pounds, strong and healthy in appearance, but excessively nervous. Mother of one child, a girl, now six years old and no trouble at the time of the birth. Became pregnant the second time in 1902, and consulted me, not because she was pregnant, but for the intense itching over the whole vulva. She was not able to sleep over an hour at a time, and was so nervous that she was constantly bordering upon hysteria. History of pregnancy for three months. Complained of frequent urination and the passage of a large amount each time. Drank water freely, as the thirst was intense.

The urine contained a considerable amount of sugar. There was no history of diabetes in the family. I attended her two sisters at the time of the birth of their children and no sugar was ever found in their urine. At the fourth month a miscarriage resulted, all distressing symptoms soon began to disappear and after one month no sugar was found in the urine and in another month she appeared perfectly well. In 1904 Mrs. G. became pregnant for the third time. About the third month the itching began, sugar appeared in the urine, and I expected she would miscarry again, but this time she carried the child to full term. The husband was somewhat alarmed at the large amount of water she was passing, saying that his wife would frequently fill a chamber at night. The itching became intense, sedatives were constantly applied, but gave only

temporary relief. Appetite somewhat abnormal. Numerous little boils were constantly forming on her back, shoulders and face. Diet-sugar and starches prohibited as far as possible. The question of bringing on premature labor was thought of, but not discussed with the patient or her husband. At last the day of labor arrived, and with the exception of the complicating rawness and edema of the vulva and vagina, the labor was normal in all respects. She made a rapid recovery and at the present time there is no trace of sugar in the urine. The baby has thrived and nursed the breast for nine months. Such is the concise history of a case of diabetes coming on with and terminating soon after labor.

I have collected the following cases from literature, and short histories are given of each.

1. Bennowitz's Case<sup>9</sup>—A young woman in three successive pregnancies, the fourth, fifth and sixth, was affected with diabetes, which each time completely ceased on delivery, but again returned when she became pregnant. The fifth child was born premature and born dead, weight 12 pounds. Menstruation occurred during the fifth pregnancy.

2. Mathews Duncan's Case<sup>10</sup>—Suspicion of temporary diabetes at the end of a former pregnancy. Death of fetus before the labor, Diabetes about the end of 8th month. Labor beginning at ninth month followed by collapse. An excess of liquor amnii complicated. Patient had very peculiar breathing and died on the third day after delivery. This was the fifth pregnancy. She had had two healthy children and two early miscarriages.

3. W. L. Reid's Case<sup>10</sup>—In the first pregnancy a macerated child. Diabetes early in the second pregnancy. Death of fetus in the sixth month. Premature labor a few days later. Excess of liquor amnii. Patient survived, but with persistent diabetes. Dr. Pavy, who saw the case, expressed the opinion that the diabetes had to do with the birth of the two dead fetuses.

4. Newman's Case<sup>10</sup>—First pregnancy and confinement normal. Diabetes persisted during the two succeeding pregnancies and till death. Second pregnancy and confinement natural. Third pregnancy, child born dead at sixth or seventh month. Death of mother on the third day after labor.

5. Newman's Case<sup>10</sup>—Diabetes in two pregnancies. Children born alive. Death of mother, two years after the birth of the last child, died after three days of coma.

6. Lecorche's Case<sup>10</sup>—Diabetes after a successful pregnancy

and delivery. Had one child six years ago and a very interesting feature was that the infant became diabetic. Her mother, a gouty woman, died albuminuric. Diabetes persisted during subsequent pregnancy and parturition.

7. John Williams's Case<sup>10</sup>—Mother and two sisters diabetic. Elder sister diabetic after confinement and recovered. Patient's first child born alive at term, diabetes found the next day. Second child born alive at term. Excess of liquor amnii and no sugar in it. Diabetes persists.

8. John Williams's Case<sup>10</sup>—Sixth child died during pregnancy. Born at the eighth month. Diabetes from early pregnancy. Death sudden, four months after delivery.

9. Aubrey Husband's Case<sup>10</sup>—Diabetes in the third pregnancy. Child born feeble, died in a few hours. Death of mother eight months after from diabetes. Liquor amnii was found to contain sugar.

10. Mathews Duncan's Case<sup>10</sup>—Diabetes began at quickening in the eleventh pregnancy. Child large and born dead. Diabetes disappeared. Relapse. Death eight months after delivery, comatose.

11. Davidson's Case<sup>10</sup>—Diabetes in the middle of fourth pregnancy. Father diabetic. Child alive, feeble, one month premature, lived 13 hours. Temporary disappearance of diabetes after labor, but it reappeared and four months afterward the patient died from diabetes.

12. Mathews Duncan's Case<sup>10</sup>—Sister died of diabetes. First pregnancy—boils, child died at eighth month, born at term. Second pregnancy—child born at term but decomposed. Third pregnancy—diabetes discovered at fifth month. Premature labor induced, child decomposed. Death the second day after delivery.

13. Frerich's Case<sup>10</sup>—Ninth pregnancy. Diabetes in eighth month. Death fifteen months later of phthisis and gangrene of the lungs. Tumor was also found in the medulla-oblongata.

14. Seegan's Case<sup>10</sup>—Three pregnancies. Diabetes present. All ended in miscarriages about the middle of pregnancy and death followed the third miscarriage.

15. F. A. Packard's Case<sup>11</sup>—Patient had four normal pregnancies and then three miscarriages.

16. H. D. Fry's Case<sup>12</sup>—Patient had one normal pregnancy. Second pregnancy resulted in death of child, and mother died of exhaustion on the fifth day.

17. E. L. Partridge's Case<sup>8</sup>—Patient in the first pregnancy. Child born alive and mother's condition good.

18. G. Herman's Case<sup>13</sup>—Patient suffered from boils, burning pain on passing water and a terrible itching. Patient delivered of a dead decomposing child, and she died nineteen days afterwards.

19. Kleinwachter's Case<sup>14</sup>—Patient had four normal pregnancies and two miscarriages. Condition of last child normal. The diabetes persisted in patient.

20. Stengel's Case<sup>14</sup>—Was referred to him by Hirst for suggestions as to dietetic and medicinal treatment. Patient's general physical condition improved under treatment, and the pruritus vulvæ speedily subsided. Labor—condition of mother and child good.

21. Whitridge Williams's Case<sup>8</sup>—Presented marked glycosuria, but went on to term. The glycosuria disappeared after labor.

22. Winckel's Case<sup>10</sup>—Diabetes observed in second confinement. Child born alive.

*Frequency.*—Diabetes is far more common in men than in women. Duncan when he wrote upon this subject 23 years ago said, that the rarity is attested not only by its having no historical place in literature, but by the actual experience of accoucheurs and hospitals. That it seldom occurs in women during pregnancy, and among his own 386 observations of diabetes, 282 were in the male sex and 104 in the female. Of these 104 of the female sex only one was ill during pregnancy and in the eighth month. The age that diabetes affects women as a rule is late in life, and Kleinwächer's statistics show the commonest age to be between 40 and 50 years. Duncan says that cases come on during pregnancy, after delivery and during the suckling period, but are not sufficiently detailed to justify any deductions from them. They merely establish a possibility of the supervention of diabetes in these states. Of diabetes in pregnancy and parturition our knowledge is scanty in the extreme and Senator notes it is a matter for wonder even that pregnancy has been known to occur in diabetic women.

*Results.*—A woman who is diabetic rarely becomes pregnant, but if she does she is generally so debilitated that she will not carry the child to term. Diabetes occurring in women of the child-bearing age results in a suppression of menstruation, and even atrophy of the uterus has been known to follow. Such being the case, it is rather fortunate that only a small number of wo-

men become pregnant, as diabetes itself is such a serious disease to handle when uncomplicated.

Duncan's tabulated cases show the following results:

1. That diabetes may come on during pregnancy.
2. Diabetes may occur only during pregnancy, being absent at other times.
3. Diabetes may cease with the termination of pregnancy.
4. Diabetes may come on soon after parturition.
5. Diabetes may not return in a pregnancy occurring after its cure.
6. Pregnancy may occur during diabetes.
7. Pregnancy and parturition may be unaffected in its healthy progress by diabetes.
8. Pregnancy is very liable to be interrupted in its course and probably always by death of fetus.

In grouping the 22 cases that I collected and the one reported by myself, making in all 23 cases, I find the following interesting facts:

Out of this number there were 12 recoveries and 11 deaths, giving a maternal mortality of 48 per cent. This includes all cases that died as the result of persisting diabetes. The fetal mortality is very high. I am not able to give the exact percentage as many of the cases reported are not complete, and for the same reason I cannot state the number of miscarriages that occurred.

There were 19 multiparæ and 4 primiparæ.

Of the 4 primiparæ, one died and three recovered.

Of the 19 multiparæ, ten died and nine recovered.

In one case reported, menstruation persisted throughout the pregnancy.

In two cases, there was an excess of liquor amnii and one woman died, the other recovered.

In one case sugar was found in the liquor amnii, this woman dying eight months after the birth of child, of diabetes.

In one case sugar was found in the urine of the infant. The mother of this child lived and so did the infant.

As these cases are so uncommon no methods of surgical treatment are advised, other than the bringing on of premature labor, if the case in our judgment justifies such a procedure.

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#### DISCUSSION.

DR. SAMUEL W. BANDLER, New York.—I would like to express my appreciation of the scientific and concise manner in which this subject has been presented to us in the excellent paper read.

I would like to call attention to one or two points. Since we do not know the etiology of diabetes, this question, from a gynecological standpoint, is bound to be obscure. The idea has been advanced that the muscles, perhaps, in some way, have something to do with the finding of sugar in the urine. In women who have uterine fibroids sugar is found in the urine proportionately more frequently than in those who have no fibroids, which may explain many of the cases in whom a hysterectomy is done and who die from pulmonary embolism. Thrombi occur much more readily in these cases than in others. If we were to examine these patients more frequently, undoubtedly we would find that sugar is an accompanying factor.

Another point is the association of diabetes with pregnancy or abortion in which, after abortion or pregnancy, diabetes disappears. What is the etiology? Do we know anything about renal irritation in these cases? This brings up the question of the so-called toxemia of pregnancy about which, too, we know very little of a positive nature.

In the toxemia of pregnancy we have yellow atrophy or other lesions of the liver; we find lesions of the pancreas, of the kidney, and in every structure of the body. We do not positively know what the causal factor of that toxemia is, or where the poison comes from. It has been said, and I believe it, that the irritating substance or poison comes from the placenta; that it irritates the nervous system; it causes the so-called eclamptic seizures, and produces lesions in the liver which can be recognized by the microscope. We know, thus,

that from the placenta comes a substance which produces irritations in organs that are the supposed source of diabetes, or of sugar excretion. If a liver condition be the cause of the diabetes, this poisonous placental substance may be one that irritates the liver in the diabetes of pregnancy. If it is the pancreas, then the substance may irritate the pancreas in these cases. Therefore, the point of interest to me is that we should begin to think of these cases mentioned by Dr. Tate as perhaps coming under the head of the toxemias of pregnancy in their manifestations, a subject to which too little attention has been really paid.