

POLIOMYELITIS IN PREGNANCY

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THE occurrence of poliomyelitis in association with pregnancy has been a subject of special interest to us over the past several years. It has been our clinical impression that in recent years we have seen these cases in a number which would suggest more than a chance distribution of the disease in pregnant women.

An analytical consideration of this subject is important because it has bearing not only on the current concepts of susceptibility to the virus of poliomyelitis but also on the prognosis of fetal survival and morbidity as well as the related obstetrical problems.

In 1945, Fox and Sennett¹ and, in 1947, Fox and Waisman² reviewed this subject and added to the literature a total of eighteen cases of poliomyelitis complicating pregnancy. At the time of the 1947 study, a survey of the literature revealed a total of 175 reported cases. Since these publications appeared, several articles of importance have been written dealing with the problems of poliomyelitis in pregnancy, further substantiating the impressions previously presented that the occurrence of poliomyelitis in the pregnant woman is no rarity in this country though reports from England show that the incidence there is comparatively low.³ While the high frequency of this mishap in our community has been alarming to us and has perhaps colored our impression of the importance of the problem, we are not unmindful of the capricious nature of poliomyelitis nor of the fact that it is a disease which varies from year to year in its intensity, distribution, and general characteristics.

In 1941, Aycock,⁴ who has repeatedly emphasized the importance of the role of variable susceptibility, reviewed this subject and estimated that one might anticipate an incidence of one case of poliomyelitis in 50,000 pregnancies. He found an actual increase in the incidence over the anticipated frequency and pointed out that the endocrine changes occurring in pregnancy might be important factors in the frequency with which the pregnant woman contracts poliomyelitis. Shaefer and Shaw⁵ have recently stated that aside from the purely endocrine changes, the stresses and strains of pregnancy may predispose toward the susceptibility to poliomyelitis. This fits in well with the fatigue factor which has been repeatedly shown to have an adverse effect on the animal or human being infected with the poliomyelitis virus.

In the past few years other investigators have become increasingly interested in this and related problems. In a report by Setälä,⁶ the author emphasizes the extension of the disease into the older age groups with an accompanying greater incidence in pregnancy. In contrast, Dauer,⁷ in his careful analysis of the age distribution of poliomyelitis indicates that the extension of the disease into the older age groups is more apparent than real and is probably accounted for by a change in the age composition of the population and by an increase in the number of cases reported per death. Horton and Rubenstein,⁸ in their

analysis of poliomyelitis in Massachusetts, have arrived at a similar conclusion. Setälä⁶ further observes that the number of pregnant women with the disease varies from year to year, suggesting an alteration in predisposition to poliomyelitis in this group. Other reports have appeared within the past five years which give support to the belief that poliomyelitis in pregnancy is assuming increasing frequency and importance. Davis and Silverstein,⁹ Baker and Baker,¹⁰ have aptly pointed to this trend.

With the recent appreciation that congenital malformations are in some instances related to rubella occurring in the first trimester of pregnancy, there has ensued a search for evidence of similar effects from other virus diseases of the gravid woman on her unborn child. Poliomyelitis is under consideration in this regard. Because this disease seems to have a relative affinity for the pregnant woman, the opportunity to study the effect of the disease on the fetus has presented itself in various epidemics. This report deals in part with such a study and brings to date our own experience with this problem, comparing it with the experience of others in hope that it may prove informative to those who are interested in the study of poliomyelitis and to those who may meet the problem in the practice of obstetrics.

Incidence of Poliomyelitis in Pregnancy

From 1943 through 1948, a total of thirty-three women in whom poliomyelitis was associated with pregnancy were admitted to South View Isolation Hospital of the Milwaukee Health Department. We have attempted to study these cases from several aspects: first, to determine if our series represented a higher incidence of poliomyelitis in pregnant as compared with nonpregnant women of childbearing age; second, to determine what effect poliomyelitis had on the course of pregnancy; and third, to determine what effect poliomyelitis might have on the surviving infants.

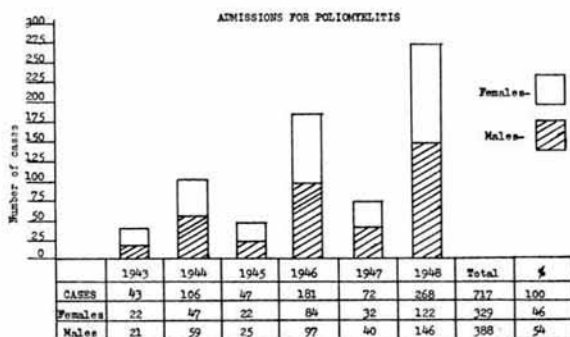


Fig. 1.

Over the course of this six-year period a total of 717 patients with verified cases of poliomyelitis have been admitted to this fever hospital in the numbers and sex ratios indicated in Fig. 1. The ratio of males to females did not vary significantly from year to year. Of the total of 717 cases, 329, or 46 per cent, were females. A further breakdown of this group of females (Table I) reveals that seventy-four patients were in the childbearing years of 18 to 45. Fifty-six of these seventy-four patients were married women, and twenty-eight of these

were pregnant. Two were immediately post partum, and one was four days post abortion at the time of admission. In addition, there were two unmarried but pregnant women admitted. This makes a total of thirty-three cases of poliomyelitis occurring in conjunction with pregnancy which have been treated over the past six years. Of all the married women of childbearing age who had poliomyelitis, 57 per cent were pregnant. Horstmann¹¹ has reported a 32 per cent incidence of poliomyelitis in pregnancy in the 1944 epidemic in Copenhagen.

In breaking down this series of 717 cases into age and sex groups as shown in Fig. 2, it is of interest that before the age of 18 years the percentage of males with clinically recognizable poliomyelitis is greater than that of females. Why this difference occurred in our series of cases is not entirely clear, but since the greatest number of cases occurred in the 5- to 9-year-old age group in both sexes, and since it has been demonstrated repeatedly that fatigue is an important factor in the occurrence of recognizable poliomyelitis,^{12, 13} it is likely that this sex difference may result from the more vigorous activity of the male child and his resultant greater fatigue.

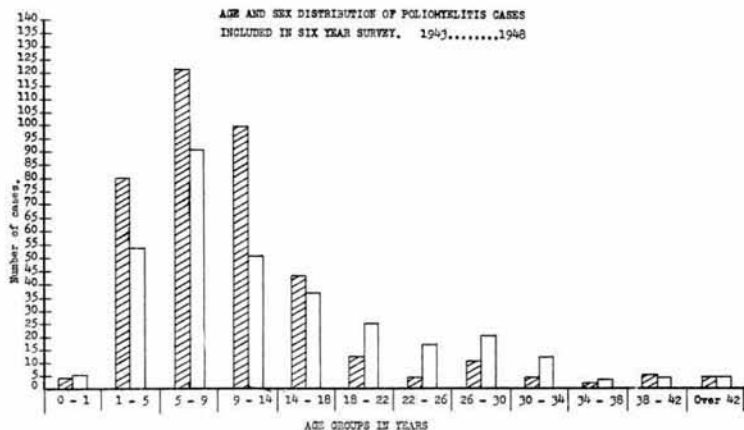


Fig. 2.

In the age group of 18 to 46 years, the sex ratios tend to reverse themselves, with forty-one men and seventy-four women, of whom forty-one were not pregnant. Thus the thirty-three pregnant women are entirely responsible for the reversal of the sex ratio seen in this adult group. This further suggests that pregnancy increases the susceptibility of the female to poliomyelitis while the nonpregnant adult female is no more susceptible to the disease than the adult male.

The incidence of pregnancy in reported poliomyelitis epidemics has been variable, but it has been previously stated^{14, 15} that the incidence of the disease is twice as great in pregnant as in nonpregnant women of the same age group. Our series indicates a similar incidence of pregnant poliomyelitis victims: 44.5 per cent of all the women in the period of fertility were pregnant and of the married women who are admitted 57 per cent were pregnant.

Whether or not the chronic fatigue or the endocrine changes of pregnancy are responsible for this difference in susceptibility is an unsettled problem and one which seems worthy of further consideration.

We feel that this 57 per cent incidence of pregnancy in the married women of our series is in excess of the proportion of pregnant married women in the population of this community. Taylor and Simmons¹⁴ estimated that 11.7 per cent of the women of Colorado between the ages of 17 and 40 were pregnant on any given day during the epidemic of 1946 in that state.

TABLE I. POLIOMYELITIS IN WOMEN, 1943-1948

Total women admitted	329
Total women, 18 to 45 years	74
Total married women, 18 to 45 years	56
Total married pregnant women	31
Total unmarried pregnant women	2
Per cent married women who were pregnant	57

Effects of Poliomyelitis on the Course of Pregnancy

There were four deaths among the thirty-three patients whose pregnancies were complicated by poliomyelitis, or a mortality rate of 12.1 per cent. Two of these died after having given birth to normal infants; one, nine days, and the other thirteen days post partum. Of the other two, one was three months and the other four and one-half months pregnant at the time of death.

Seven patients, or 21.2 per cent, aborted. Since the over-all incidence of abortion in pregnancy has been estimated at 24 per cent,¹⁵ it would seem that the occurrence of abortion in the group of patients under study is not in excess of that which might normally have been anticipated had the women not contracted poliomyelitis; however, such a direct comparison is not entirely applicable for this selected group. Gifford and Hullinghorst¹⁶ have reported a fetal death rate of 26 per cent in a survey analysis of 170 cases of poliomyelitis in pregnancy. In our group of seven patients who aborted, one was 1 month pregnant, one was 2 months, two were 3 months, two were 3½ months, and one was 5½ months pregnant. Thus all the abortions occurred within the first two trimesters: four in the first and three in the second. One of these patients aborted four days prior to the acute onset of her illness. The other patients aborted during their periods of isolation or very shortly thereafter. This would seem to suggest a relationship between the acute illness and the abortion.

The severity of the paralytic manifestations of the disease seemed to bear no relationship to the tendency to abort, a few of the most severely paralyzed mothers having carried their babies to full term.

None of the patients in this series developed straight bulbar paralysis, in spite of an incidence of 18.2 per cent of such cases with a 48.2 per cent mortality occurring in the 1948 epidemic in this community. Although a few of the pregnancy cases developed cranial nerve signs, the initial evidence of the disease appeared first as manifestations of cord involvement. Taylor and Simmons¹⁴ reported four presumably straight bulbar cases in their series of twenty-five pregnancies, which would indicate that this single manifestation of the disease does occur in pregnant women. The absence of such cases in our series has given us cause to wonder regarding the common portal of entrance of the virus in pregnant women.

From an analysis of the cases included in this series, it was found that the ages of these patients varied considerably within the period of fertility. The history of previous pregnancies seemed to be of no significance. In a follow-up study, fifteen of the thirty-three patients related no subjective evidence of residual disability from the disease. Fourteen patients related varying degrees of residual paralysis or paresis resulting from their acute disease.

Effect of Poliomyelitis on the Infant

A follow-up of the twenty-nine living patients and their offspring revealed that twenty normal babies of average birth weight were born to the surviving mothers. Two more normal babies were born to mothers who subsequently died of poliomyelitis. Two infant deaths occurred in our series. One of these was the result of erythroblastosis and the other resulted from cord hemorrhage which presumably occurred during labor. Seven patients aborted and two could not be traced. Two of the babies were delivered by cesarean section. In both of these cases the mothers were severely affected and both had flaccid abdominal muscles. No complications of pregnancy other than poliomyelitis were reported except in one patient who had syphilis. The baby of this mother was normal, however.

In this study we could find no evidence to suggest that poliomyelitis affecting the pregnant woman leaves any stigma on the fetus if it survives the acute illness of the mother. Significant congenital malformations are thought to occur in the relatively early phases of pregnancy while the embryo is undergoing its complex structural development. We might logically anticipate that if poliomyelitis were to affect the infant in utero, it would most likely become manifest in those infants whose mothers contracted the disease early in pregnancy, particularly within the first three months. In our series, eight of the women admitted to the hospital were three months pregnant or less and subsequently delivered normal infants. Of these, four were less than two months, two were two and one-half months, and two were three months pregnant at the time of admission.

Four other women who were pregnant three months or less aborted in association with their poliomyelitis attacks. We did not have the opportunity to examine the products of conception in these cases in order to search for congenital malformations.

In the eight cases of early pregnancy which we have been able to study, no congenital malformations resulting from poliomyelitis were observed. In this respect our study is in agreement with previous impressions gained through clinical study and animal experimentation. One cannot help but be impressed by the fact that this most deadly and crippling disease leaves no apparent mark on the surviving babies while the relatively benign virus infection of rubella leaves in its wake infants who are blind, deaf, or in many other ways deformed.

Conclusions

From a study of 717 patients with poliomyelitis admitted to the South View Hospital during the past six years, a total of thirty-three patients were found in whom pregnancy coexisted with this disease. These patients were studied with regard to the incidence of poliomyelitis in pregnancy, the effect of the disease on the course of pregnancy, and the effect of the disease upon the surviving infants born to these patients.

This study revealed that 57 per cent of the married women of childbearing age admitted for poliomyelitis were pregnant. This is considered well in excess of the percentage of pregnant married women in the random population and would seem to indicate an increased susceptibility of the pregnant woman to clinically recognizable poliomyelitis.

Of the thirty-three cases of poliomyelitis in pregnancy herein presented, the incidence of abortion was 21.2 per cent, which, while not unusually high for a group of pregnant women, was nevertheless closely associated with the episodes of acute illness. Four patients died, making the mortality rate 12.1

per cent for the group. Labor and delivery were complicated as a result of poliomyelitis in only two patients and these were delivered successfully by cesarean section.

A follow-up study of this group of women revealed that twenty-two normal babies of average birth weight were born. There were two infant deaths: one stillbirth resulting from cord hemorrhage, and the other from erythroblastosis. There is no evidence to indicate that poliomyelitis in the mother left any stigma on the surviving infants.

References

1. Fox, M. J., and Sennett, L.: *Am. J. M. Sc.* 209: 382, 1945.
2. Fox, M. J., and Waisman, H. A.: *Am. J. M. Sc.* 214: 148, 1947.
3. Annotations: Acute Poliomyelitis in Pregnancy, *Brit. M. J.* 2: 1071, 1948.
4. Aycock, W. L.: *New England J. Med.* 225: 405, 1941.
5. Schaefer, J., and Shaw, E. B.: *California Med.* 70: 16, 1949.
6. Setälä, A.: *Ann. chir. et gynae. Fenniae* 36: 117, 1947.
7. Dauer, C. C.: *Am. J. Hyg.* 48: 133, 1948.
8. Horton, R. J. M., and Rubenstein, A. D.: *New England J. Med.* 238: 169, 1948.
9. Davis, W. D., and Silverstein, C.: *U. S. Nav. M. Bull.* 47: 1102, 1947.
10. Baker, M. E., and Baker, I. G.: *Minnesota Med.* 30: 729, 1947.
11. Horstmann, P., Ipsen, J., and Lassen, H. C. A.: *Nord. med.* 30: 807, 1946.
12. Russell, W. R.: *Brit. M. J.* 2: 1023, 1947.
13. Hargreaves, E. R.: *Brit. M. J.* 2: 1021, 1948.
14. Taylor, E. S., and Simmons, J. M.: *AM. J. OBST. & GYNEC.* 56: 143, 1948.
15. Maternity Center Assn.: *Public Health Nursing in Obstetrics*, New York City, 1948, Part I.
16. Gifford, H., and Hullinghorst, R. L.: *AM. J. OBST. & GYNEC.* 55: 1030, 1948.