Are Women Carrying "Basketballs" Really Having Boys? Testing Pregnancy Folklore

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ABSTRACT: Background: *Antenatal ascertainment of fetal sex is a common feature of modern pregnancies. Women who opt not to learn fetal sex typically employ a variety of methods to forecast it. This study investigated the validity of prevalent folklore used to identify fetal sex before birth.* **Method:** *One hundred four pregnant women, who did not know the sex of the fetus, were administered a questionnaire to explore their perceptions of fetal sex and the basis for these predictions.* **Results:** *Fetal sex was not systematically related to the shape of the woman's abdomen, prevalence of morning sickness, or comparisons with previous pregnancies. However, women who had more than twelve years of education correctly predicted fetal sex greater than chance (71% correct), in contrast to less educated women (43% correct). Contrary to expectations, women whose forecasts were based on psychological criteria (i.e., dreams or feelings) were more likely to be correct than those employing prevalent folklore criteria (i.e., the way a woman was carrying the pregnancy).* **Conclusions:** *In general, women were not good predictors of fetal sex. The mechanisms that promote maternal accuracy in predicting fetal sex for highly educated women are unknown. It is reasonable to expect that maternal perceptions of fetal sex contribute to the process of fetal attachment. (BIRTH 26:3 September 1999)*

Advances in prenatal diagnostic technology have provided women with the opportunity to ascertain the sex of their fetuses before delivery. Amniocentesis, chorionic villus sampling, and ultrasonography are routinely used in obstetric care for diagnostic purposes. Currently, most pregnant women in the United States want to learn fetal sex prenatally, with estimates as high as 75 to 81 percent (1,2). Few studies have addressed how and whether knowledge of fetal sex alters the attachment process (3,4) as well as other psychological features of pregnancy (5). In particular, antenatal ascertainment of fetal sex that is in conflict with desired sex appears to affect maternal perceptions of the fetus (6) and provides an opportunity to resolve resultant disappointment or depression (5,7).

Couples who decline to learn the sex of their fetus cite two main reasons: wanting to be surprised at delivery, and acceptance of either sex with a primary focus on health (4,8). However, anecdotal evidence indicates that these couples maintain a high interest in the expected baby's sex and enjoy endless speculation. The most common question asked by friends and relatives after a baby is born concerns the baby's sex, not health (9). Because technologically based antenatal sex ascertainment is a relatively new phenomenon, an enormous body of folklore that purports to predict fetal sex has developed and been maintained in the common culture (10,11). These ''old wives tales'' range from the prosaic (e.g., carrying high and up front means a boy) to the obscure (i.e., a needle held over the mother's abdomen indicates a girl if it swings in a circular fashion). Although some folkloric methods are improbable, others possess some biologic plausibility. For example, the folklore that morning sickness indicates a girl has some scientific basis: of 66 women hospitalized with severe hyperemesis during pregnancy in one study, 44 were carrying girls (12). The authors specu-

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lated that this disparity might be related to elevated human chorionic gonadatrophin levels observed in female fetuses. However, one of the most persistent and unfounded myths, that faster fetal heart rates signify girls, continues to be perpetuated by medical caregivers. Although this assumption is probably based on the fact that boys are slightly larger, and larger individuals tend to have slower heart rates, the validity of this association does not extend to the level of the individual case. In fact, no modern study of fetal heart rate has documented significant sex differences in fetal heart rate at any point in gestation (13–15).

This study investigated the ability of women to predict the sex of their fetus and the validity of several common folklore methods of fetal sex ascertainment.

Methods

The study sample was recruited from the two sources of prenatal care at a major university hospital in Baltimore, Maryland, between January 1993 and July 1994: the waiting room of private obstetric caregivers and a fetal assessment and diagnostic center. The only eligibility criteria were that women were at least 18 weeks' pregnant with a singleton pregnancy. At the outset our goal was to enroll a group of women prospectively who did not know the sex of their fetus and also a comparison group of women who did know, so as to provide information on demographic and psychological characteristics that differentiated the two. However, it became clear that the great majority of women in these settings already knew the fetal sex, and locating a sufficient sample of those who did not was challenging. The ratio of the recruited control versus naive group quickly grew large (roughly 20 interviews before a participant who did not know fetal sex could be identified). Lacking the resources to continue interviewing the comparison group, we altered the study design to include only women who did not know the sex of their fetus. This final sample consisted of 104 women. Fetal sex was verified from labor and delivery records.

Data were collected using a survey instrument developed for this study. It included both demographic information (age, years of education, gestational age at interview, parity) and maternal prediction of fetal sex. In addition, the degree of certainty associated with their prediction was assessed, ranked on an ordinal scale ranging from 1 (very unsure) to 5 (positive). Women were then asked on what they had based their guess: comparison with a previous pregnancy, a dream, the way they were carrying this baby, just a feeling, other child's belief, or some other reason. Up to three reasons were coded for each participant, if provided. Data were also collected from all participants on two common sex predictors that could be externally validated: the way the woman was carrying the pregnancy and morning sickness. For the former, each woman was asked to assess the shape of her abdomen: all up front, spread around the hips, or in between. Abdominal shape for a subset of women ($n = 62$) was also independently rated by the interviewer. The prevalence of morning sickness (i.e., nausea and vomiting at any time of the day not associated with illness) was assessed on a three-point scale (none, occasionally, frequently).

Analyses

Data were analyzed using SPSS for Windows 8.0 (16). A series of simple logistic regression analyses were performed with each of the following independent variables: maternal age, race, years of education, gestational age at interview, and the number of previous births. Basic descriptive statistics (frequencies for nominal data, means, and standard deviations for ordinal data) were calculated. Cross-tabulations with chi-square tests were used to test the degree of association between the predictor and outcome variables. Multiple response groups were created to analyze the reasons women gave for predicting the sex of the fetus; this procedure collapsed all of the frequencies of a given response across the three variables in the data set (i.e., reasons 1–3). Finally, a series of exploratory logistic regression analyses were performed to examine the relative magnitude of the strength of each predictor variable.

Results

Sample characteristics are presented in Table 1. The average gestational age at the time of the interview was 34 weeks. All women indicated that they had the opportunity to learn the sex of their fetus. The overwhelming response to the question ''Why don't you want to find out?'' involved the desire to be surprised. Several other psychological reasons emerged, such as ''hoping that the baby is healthy is enough to ask; don't want to jinx it.'' In contrast, 69 percent of women acknowledged withstanding a significant amount of pressure to learn the sex of the fetus from others, including from their spouse (31%), grandparents (15%), another child (11%), or another relative (11%).

Forty-nine percent of women guessed that the fetus was a boy and forty-two percent predicted a daughter; the remainder would not guess. Forty-five percent of the women later delivered a boy; we were unable to document infant sex for two cases. Overall, 55 percent of the participants correctly guessed the sex of their fetus; this is not significantly different from chance

Table 1. Demographic Characteristics of the Sample

Characteristics	*Do Not Know Fetal Sex (n = 104)*
Mean maternal age (yr)	27.3
Standard deviation	6.56
Mean maternal education (yr)	13.5
Standard deviation	3.18
Nulliparas	53 (52%)
Multiparas: no. pregnancies	
One	30 (29%)
Two	15 (15%)
Three	1 (1%)
Four	3 (3%)
Five	1 (1%)
Mean gestational age (wk)	33.9
Standard deviation	5.91
Maternal race	
White	32 (37%)
Black	49 (57%)
Other	5 (6%)
Prenatal testing	
None	2 (2%)
Ultrasound	88 (86%)
CVS/amniocentesis	12 (12%)

CVS = chorionic villus sampling.

(Z = 1.02). No statistical relationship was found between the time in gestation when the interview occurred and the accuracy of prediction.

For first-time mothers, the most common single reason given in predicting fetal sex was a psychological one (i.e., just a feeling); for multiparas, the previous pregnancy was most often used as a basis of comparison (61%). For all participants the next most common attribution was the way the woman was carrying the baby (30%). Dreams and the level of fetal activity were cited 14 percent and 10 percent, respectively. Forty-one percent of participants offered other, typically idiosyncratic explanations of their prediction, including other pregnancy folklore (i.e., the drain cleanser Drano dissolved in morning urine); family history (i.e., all of the previous births in the family have been boys); and patterns of weight gain (i.e., slow to gain weight). One woman cited her manicurist's wisdom that chipping nails indicated a male fetus; another woman had been told that taking Clomid resulted in more girls. The percentages did not total 100 percent because respondents had the opportunity to cite up to three reasons.

Overall, women had confidence in their predictions. More than two-thirds rated their guess as ''somewhat sure,'' ''quite sure,'' or ''positive.'' Most women who based their guess on the way they were carrying the baby (79%) or compared this pregnancy to a previous pregnancy (85%) rated their certainty as somewhat sure or stronger. Women who included a dream about the fetus among their reasons for guessing the sex were less certain about their guess; half of these women rated their certainty as ''not very sure'' or less. Women who were more certain about their guess were not more likely to be correct ($\chi^2(2) = 2.60$).

Separate analyses were performed to test the predictive validity of the prevalence of morning sickness and the way the woman was carrying this pregnancy. Almost one-half (45%) of the participants reported having no morning sickness with this pregnancy, 28 percent reported some, and 27 percent had a high degree of nausea and/or vomiting, respectively. No statistical relationship was found between the presence of morning sickness and fetal sex ($\chi^2(2) = 0.79$). An analysis of only the women who reported the highest level of morning sickness also did not reveal a significant sex differential ($\chi^2(1) = 0.02$), although 57 percent of these pregnancies had female fetuses.

Fifty-four percent of women rated the shape of their abdomen as ''all up front,'' and only 17 percent thought their weight was distributed across their hips; the remainder could not distinguish between the two. For the subgroup of participants who were also rated by the interviewer, the agreement between the judgment of the interviewer and the participant was only moderate (kappa = 0.48). More cases of disagreement occurred in which women reported their abdomen as shaped ''like a basketball,'' but the interviewer rated the shape of the abdomen as ''spread across the hips'' or ''in between.'' However, evidence did not support a systematic relationship between the shape of the woman's abdomen and the infant's sex, whether rated by herself (χ^2 (2) = 2.60) or by the interviewer (χ^2 (2) = 2.28). Although not germane to this lack of results, there was confusion in the sample as to which shape was associated with which sex. Forty percent of women who rated themselves as carrying ''all up front'' predicted they were having a girl; 57 percent predicted a boy.

Giving birth previously did not make women better at predicting the sex of this fetus; 55 percent of both the multiparas and nulliparas guessed the fetal sex correctly. Multiparas who explicitly used a previous pregnancy to form the basis for their prediction were also no better than chance at predicting fetal sex (61.5% correct).

Wide ranges occurred in the distributions of several of our independent variables. Specifically, maternal age ranged from 13 to 40 years and length of education ranged from 9 to 20 years. Additional analyses were performed to determine if these or other demographic characteristics were systematically related to women correctly predicting the sex of their fetus. No relationship was found between maternal age, race, gestational age, or number of previous births and the accuracy of

the women's predictions. Years of maternal education was the only variable that was statistically significant ($p < 0.04$); women with increasing years of education were significantly better at correctly predicting the sex of their baby.

Exploring Differences in Levels of Education

Additional analyses were undertaken in order to explore the relationship between level of education and women correctly guessing the sex of their fetus (Table 2). A dichotomous variable was created that separated women with 12 years or less of education ($n = 57$) from those whose education extended beyond high school ($n = 45$). The group with more education tended to be older (median = 32 years vs 24 years), and 73 percent had at least 4-year college degrees. Based on this classification, 71 percent of women in the higher education group correctly predicted infant sex, compared with only 43 percent of the less educated group. No difference occurred in the predilection of either group to guess they were having boys (47% in the lower educated group vs 49% in the more educated group, respectively). Not only is this difference in accuracy of prediction highly significant ($Z = 2.83$, $p < 0.001$), but women in the higher educated group were also significantly better at predicting fetal sex than expected by chance ($Z = 3.11$, $p < 0.001$). The less educated women guessed the gender of their baby at a rate that was no worse than chance.

The two groups of women also differed in the reasons they provided for believing the fetus was a particular sex (Table 2), the percentage of the cases that cited each reason, and the percentage of women citing each reason who were correct in their prediction. Almost three times as many women with more years of education cited having a dream as the reason they believed their fetus was a particular sex compared with less educated women (21% vs 8%). Interestingly, all eight women in the higher education group who listed a dream as one of their reasons were correct in their prediction of the fetal sex. In contrast, three of the four women in the lower education group who listed a dream were wrong in their prediction.

Women with less education rated their degree of certainty associated with their guess as moderate to high more frequently than women with more than 12 years of education (74% and 59%, respectively). Nearly all of the less educated women who compared this pregnancy with a previous pregnancy rated their certainty as ''somewhat sure'' or higher, as did 70 percent of the more educated women. Both groups were more likely to feel certain when they based their guess on how they were carrying the baby (74% and 88%, respectively) and less certain when they listed a dream as a reason (50% and 57%, respectively). However, degree of certainty was not found to be significantly related to correct prediction for either of the subgroups: less educated women ($\chi^2(1) = 0.04$) and more educated women ($\chi^2(1) = 0.00$).

Discussion

Based on our review of the literature, this is the first study to evaluate the ability of women to predict fetal sex and specifically assess the predictive validity of some common folklore methods. In general, women were not good predictors of fetal sex, and neither the presence of morning sickness nor the shape of a woman's abdomen during pregnancy was associated with fetal sex. Women were not good reporters of the way they were carrying the baby, and were unlikely to perceive themselves as being wide across the hips. Women also misapplied the folklore; they often used a common sex predictor but applied it incorrectly to the fetal sex. This was analyzed specifically in relation

Table 2. Reasons for Women Predicting Fetal Sex and Percent Correct by Level of Education

Education	*Reason for Prediction*	*Cases No. (%)*	*Correct Predictions No. (%)*
Lower education	Other	23 (45)	11 (48)
(≤ 12 yr)	Way carrying	19 (37)	9 (50)
	Just a feeling	17 (33)	6 (35)
	Compared with previous pregnancy	16 (31)	9 (60)
	A dream	4 (8)	1 (25)
	Fetal activity/temperament	4 (8)	0 (0)
Higher education	Just a feeling	17 (44)	13 (76)
(≥ 13 yr)	Other	14 (36)	10 (71)
	Compared with previous pregnancy	11 (28)	7 (64)
	A dream	8 (21)	8 (100)
	Way carrying	8 (21)	5 (63)
	Fetal activity/temperament	5 (13)	3 (60)

Note: Up to three reasons were coded for each participant; numbers do not sum to 100%.

to abdominal shape, but was also anecdotally noted across different folklore methods. Contrary to expectations and a previous report (8), multiparas did not predict fetal sex more accurately than nulliparas. Comparisons with a previous pregnancy, applied by 61 percent of multiparas, were not useful in ascertaining fetal sex of the current pregnancy, suggesting that subsequent pregnancies differ from one another in ways that are not influenced by fetal sex, or at least not detectable to the pregnant woman.

When the sample was stratified by educational attainment, a striking difference emerged. Seventy-one percent of women with more than a high school education, which typically included a 4-year college degree in this sample, correctly identified fetal sex, and this was significantly better than chance. Conversely, women who had a high school education were correct in guessing the sex of their fetus only 43 percent of the time. This rate of accuracy was not significantly worse than chance. For every reason offered by women in the two groups, the percentage of more educated women that were correct in the prediction ranged from 60 to 100 percent; the range for the less educated women was from 0 to 60 percent. This disparity was not predicted, and its origins are unclear. The two groups of women differed in the reasons that they offered for why they believed the fetus was a particular sex: more educated women were more likely to cite internally based reasons (i.e., feelings or dreams, 65%), whereas less educated women relied less on these reasons (41%). We are at a loss to explain an education-based difference for a subject that is not directly related to educational attainment. However, we can offer one speculation concerning a group difference in participants' interpretation of the main question about fetal sex: women in the less educated group seemed more likely to answer that they thought they were having an infant with one sex rather than the other because they preferred one sex, without giving the issue the same degree of evaluation present in the more highly educated group. Thus this group difference may be a result of differences in the degree to which women analyzed any information they may have had concerning the sex of their fetus.

On what basis did the more highly educated women guess correctly? As noted, each folklore method was associated with a correct guess at least 60 percent of the time, and emotionally based guesses were most accurate. As researchers, we must confess to being troubled by the better validity of these methods when compared with those having some biologic plausibility, and it is always possible that this was a spurious finding. It is equally likely that there is simply much about the maternal-fetal connection that we do not know. Subsequent investigations would benefit by including more qualitative data to try to understand the nature of the information women use that contributes to internally based attributions of fetal sex.

In this study, 91 percent of women who chose not to learn the fetal sex by modern technology nonetheless were willing to predict the baby's sex. Most were at least somewhat sure that they were correct. No relation was found between level of certainty and correct prediction, and the folklore methods in which women had the greatest degree of confidence (i.e., comparisons with previous pregnancies, abdominal shape during pregnancy) were least likely to be accurate predictors. Less educated women, who were poorer predictors, were also more confident in their (wrong) guesses than well-educated women. There is consistent evidence that women construct images of their fetuses' characteristics and personalities that are maintained after birth (16). Although studies of this aspect of fetal attachment are limited to women who do not know the fetal sex, it is reasonable to expect that perceptions of fetal sex contribute to this process. Before birth, parents who learn that their fetus's sex is in contrast to the sex they prefer undergo emotions ranging from disappointment to mourning, depending on a variety of factors (5,7). Parents who expect that their infant will be a boy or girl based on pregnancy folklore but are incorrect may undergo similar transitions after birth. Many couples still value the element of surprise associated with not knowing the sex of their baby before birth. They may find comfort in knowing that the many folklore methods friends and family may employ in an effort to divine the baby's sex before birth are unlikely to spoil their surprise.

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