

**UNDERSTANDING THE EFFECTS
OF
THE OBSTETRICAL ULTRASOUND**

by

Sharon A. Durbin

A Research Paper

Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
With a Major in

Education

Approved: 2 Semester Credits

Investigation Advisor

The Graduate College
University of Wisconsin-Stout

October, 1999

The Graduate College
University of Wisconsin – Stout
Menomonie, Wisconsin 54751

ABSTRACT

	DURBIN	SHARON	A.
(Writer)	(Last Name)	(First Name)	(Middle Initial)

UNDERSTANDING THE EFFECTS OF THE OBSTETRICAL ULTRASOUND
(Title)

EDUCATION	KAREN ZIMMERMAN, Ph.D.	October 1999	116
(Graduate Major)	(Research Advisor)	(Month/Year)	(No. of Pages)

American Psychological Association Publication Manual
(Name of Style Manual Used in this Study)

Ultrasound has revolutionized the practice of obstetrics and significantly influenced the way society regards the fetus in utero. This study views the value of the obstetrical ultrasound in terms of human phenomenon. It questions whether neonatal outcome is improved by ultrasound as a means of maternal-fetal bonding. It speculates whether the bond formed is strong enough to influence maternal health behaviors, particularly nutrition, smoking and alcohol consumption.

The research occurred in July/August of 1999 in the Midwestern United States, using a convenience sample from Women’s Health Clinic. The sample involved 61 subjects receiving an obstetrical ultrasound during the 18 – 22 week gestation of pregnancy.

The data was analyzed and statistical analysis was by paired Student

t-test with $p < 0.05$ being considered significant. An observational component looked at such physical reactions as facial expression, movement, ideas, verbal reactions and their relationship to maternal feelings.

Analyzing maternal-fetal bonding and the obstetrical ultrasound, evidence from this study supports the theory that these two variables are directly related. Looking at the mean scores of all of the subscales of the Cranley Maternal –Fetal Attachment Scale, the results showed an increase in all but one subscale, attributing to fetus, which is a category related to later gestational ages. The subscales of roletaking, differentiation of self from fetus, giving of self, and interaction with fetus, all increased their mean scores from the pre-test to the post-test. This is indicative of behaviors that represent a connection and interaction between mother and fetus. Mothers demonstrated a higher level of attachment to their fetus following the obstetrical ultrasound. Variables were further categorized in relation to gravida, maternal age, marital status, education, and income. Maternal-fetal attachment scores showed significant difference at the .05 level in regards to age, with younger mothers showing higher attachment. Married mothers were significantly different in maternal-fetal attachment as compared to single moms in total MFA score. Education did not appear to be significant to bonding, while income did have an impact in the areas of roletaking and differentiation of self from fetus. Additionally, observational evidence is in definite support of maternal-fetal bonding.

Maternal-fetal attachment has been shown to alter maternal life-style and behaviors thus proving beneficial to the fetus. Quantitative data in relation to

nutrition showed a convincing and significant correlation with ultrasound and overall maternal behavior changes. Nutritional status showed an increase in the number of fruits and vegetables, an increase in milk products consumed, along with an increase in the number of mothers starting the day with breakfast.

The Health Habit Questionnaire showed a small significance in relation to nutritional status when the subjects were divided by age with the younger group (<29 years old) appearing to eat fewer servings of fruits and vegetables, as well as fewer servings of meat and fish or alternatives than Group 2 (30 or older.) Improved nutritional habits were noted in the married respondents and those of higher socioeconomic status. The Health Habit Questionnaire showed significant results in relation to annual gross income. Mean scores were higher on the questions relating to percentage of nutrition, number of servings of milk, fruits and vegetables, cereals and breads and the amount of fish/meat/alternatives. Level of education of the respondent appeared to only have limited significance in the nutritional status.

Subjects that consumed alcohol or smoked were not well represented. Overall, it did appear to alter the number of smokers on a finite basis, while those subjects consuming alcohol were in inadequate numbers to draw any conclusions.

The study serves to raise the ultrasound community's consciousness to the importance of the psychological effects of the obstetrical ultrasound.

ACKNOWLEDGEMENTS

"And what is as important as knowledge?" asked the mind.
"Caring, and seeing with the heart," answered the soul. –Flavin

It is said that a journey begins with a single step. That is how this paper began, slowly, methodically, thoughtfully, by placing one foot in front of the other, by allowing one word to flow after the next. The progression involved more than the physical effort. It came from within the heart and soul and only with the kindness and heart of so many important others. I dedicate this paper to them...the people who have given me a part of themselves and taught me the essence of life and the significance of others.

It was a journey of obtaining knowledge and wisdom to help others understand more deeply. Walking, shuffling, rambling, observing my surroundings, it began as a backcountry adventure in words. It began revealing itself as a demanding pursuit pushing me forward, filled with wanderlust. I realize it would not have been possible without the spirit-filled community of people that have surrounded me.

In the spirit of wilderness and freedom, Dr. Karen Zimmerman inspired me with asking me about my quest: what made me take the path I wander down. Her smiling face, bright eyes and nodding head kept me walking onward, always down the straight and narrow. You have my admiration, my respect and my gratitude. Your invaluable guidance has steered me safely along this path. Your wisdom and understanding guided my trek.

Through rough terrain and rocky peaks, Ida Mae kicked the pondering pebbles of contemplation with me as I ambled down new pathways. You were there when I stumbled and always picked me back up...no matter what. "Pick yourself up, brush off the dust, and continue onward." "Keep walking," you would revitalize me. Thank you for your listening ears, open heart and motivation when I thought it just was not possible. Most importantly, you diminished my load by reminding me of the Light that peers out of all the darkness. You were my strength to proceed. Your thoughts and words are etched deeply within my heart. You have that magic that keeps me laughing and moving along.

With a plunging canyon swiftly racing to meet me, David and Elizabeth's immeasurable patience and understanding have been God-sent. Tripping uncontrollably, they explained it was a normal process when "walking the walk" and it would improve. Your patience and fortitude in answering my numerous questions, the many insightful conversations during the development of the ideas in this thesis, and helpful comments on the text, all carried on long distance via email, will remain with me.

Keeping a steady pace, with arms swinging, I see my patient and loving husband, Steve, whose quiet encouragement and sensitive understanding and calmness, kept me going when I thought I could go no longer. Your unlimited patience and tolerance, your quiet encouragement and perpetual faith in me over the years have provided me with a resolution of strength.

As one foot preceded the next and the rhythm of movement was set, it occurred to me that this issue of maternal-fetal bonding is such a small part of the total picture of the mother-child relationship. Can this small puzzle piece really have ramifications or implications? It was Judy Valen, librarian at Luther Hospital-Midelfort Clinic, who allowed me to not only find those puzzle pieces, but helped me put the puzzle together. Judy is a necessity on an excursion such as this.

Seeing shadows, wondering which way to proceed, Beth, the greeter at Women's Health, so willingly handed out and collected the data sheets. Beth was the shiny penny I found on the ground as I trailed along. You have helped me to keep things in perspective and inspired me to keep learning. Thank you for being a friend and for your sensitivity.

Walking and stumbling, I turn back to look to see a friend, Donna Bush, who always listened when perhaps she never understood what I was talking about. She was the familiar face, the familiar voice one so urgently needs to see when they are trying to find their way. You have always been ready with words of encouragement, laughter and kindness.

To someone who has braved the trip with me, Cindy, my fellow sonographer, who recorded all the qualitative data as an unobtrusive observer. She approached my journey as a friend who joins your trail when you feel you can no longer continue....as is someone comes along and takes your hand and guides you a way on your journey --- only long enough to set you free again to explore what's left.

Midelfort Clinic has been a large part of the environment I have threaded upon. They have allowed me the opportunity and the encouragement to do the research. Thank you for allowing me to fulfill my dream that has come from the musty old-book shelf of my life.

To Chris Ness, who pushed the rocks away – those obstacles that blocked my path. Statistics felt like Sisyphus, a character in Greek Mythology, who was condemned to ceaselessly rolling a rock to the top of a mountain, where upon the stone would fall back upon its own weight. The gods had thought with some reason that there is no more dreadful punishment than futile and hopeless labor. The understanding is that there is no fate that cannot be surmounted. The struggle itself is the challenge. Chris possesses the characteristics of Sisyphus: competence, perseverance, and single-mindedness and set an example for me to follow. Your statistical expertise allowed me to make sense of all those numbers. Panting, sweating, almost finished, I turn the bend where life is awaiting unexpected and unknown adventure.

My walk continued as reflection....slow and methodical...much like a walk as evening's darkness draws near...you walk, you reflect...you see into windows of light and it all emerges into day's new dawn as the culmination draws near.

Feeling the warmth that comes from within as you approach the end of a journey, I thank God, my father, for the energy, the passion and love that comes from within to continue the walk. He helps me hear the birds twittering, the children's

voices, and protects me like no one else can. Thank you, Lord, for making me whom I am. He has provided me all with YOU. Thank you, Lord, for ALWAYS being there, beside me.

Thank you, ALL, for being a part of my life. I will treasure you always!

“When we walk to the end of all the light we have,
and take a step into the darkness of the unknown, we must believe one of two things will happen:

That we will land on something solid or we learn to fly.” (Unknown)

TABLE OF CONTENTS

	Page
ABSTRACT.....	ii
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	x
LIST OF TABLES	xiii
CHAPTER I INTRODUCTION	1
• Background and Justification of the Study	1
• Statement of the Problem	4
• Null Hypothesis	6
• Definition of Terms	6
CHAPTER II REVIEW OF THE LITERATURE.....	9
• The Obstetrical Ultrasound Exam	9
• The RADIUS Study	10
• The Educational Process in the Ultrasound Exam Room	12
• The Psychology of Ultrasound	15
• An Anthropologist's View---Janelle Taylor	16
• Impact of Ultrasound on the Abortion Issue	17
• Opposition to Fetal ultrasound Videotaping for Entertainment	18
• Maternal-fetal Bonding and Attachment	19
• Improved Dietary Habits	23
• Effects of Smoking	24

- Effect of Alcohol Use25
- Summary27

CHAPTER III METHODOLOGY28

- Introduction.....28
- Subjects.....28
- Instruments.....29
- Procedures30
- Data Analysis32
- Limitations.....33

CHAPTER IV RESULTS AND DISCUSSION.....35

- Introduction.....35
- Demographic Characteristics35
 - Age36
 - Marital Status37
 - Ethnicity38
 - Education39
 - Income40
 - Planned Pregnancy40
 - Miscarriages41
 - Birth Defects41
 - Fetal Movement42
 - Number of Pregnancies43

- Statistical Analysis (See List of Tables).....44
- Qualitative Data.....78
- Discussion.....82

CHAPTER V SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS..93

- Summary93
- Conclusions96
- Recommendations for Future Research99
- Clinical and Educational Implications100

BIBLIOGRAPHY**104**

APPENDIXES

- Appendix A – Consent Form110
- Appendix B – Obstetrical Ultrasound Intake Form111
- Appendix C – Health Habit Questionnaire112
- Appendix D – Three Questions following Ultrasound Exam114
- Appendix E – Sonographic Analysis115
- Appendix F – Cranley Maternal-Fetal Attachment Scale116

List of Tables

Table	Page
1. Age of Mother	36
2. Marital Status	37
3. Ethnicity	37
4. Level of Education	39
5. Annual Gross Income	40
6. Planned or Unplanned Pregnancy	40
7. History of Miscarriage	41
8. Previous Child with a Birth Defect	41
9. Fetal Movement	42
10. Number of Pregnancies	43
11. Nutritional Status – Pre and Post-test	44
12. Dietary Habits – Pre and Post-test	46
13. Statistical Analysis of Health Habit Questionnaire.....	48
14. Independent Groups <i>t</i> -test on Health Habits Using Age.....	49
15. Independent Groups <i>t</i> -test on Health Habits Using Marital Status	51
16. Independent Groups <i>t</i> -test on Health Habits Using Education	52
17. Independent Groups <i>t</i> -test on Health Habits Using Gross Income.....	54
18. Alcohol Consumption and Smoking – Pre and Post-test	55
19. Attempts at Changing Smoking and Alcohol Consumption	57
20. Cranley Maternal-Fetal Attachment Scale Pre-test	58

21. Cranley Maternal-Fetal Attachment Scale Post-test	60
22. Dependent Groups <i>t</i> -test on MFA Scale	62
23. Items from the Subscales of Maternal-Fetal Attachment Scale.....	65
24. Total Subscale Scores of Cranley Maternal-Fetal Attachment	67
25. Independent <i>t</i> -tests on MFA Subscales.....	68
26. Independent <i>t</i> -tests of Subscales of MFA related to Gestational Age...	69
27. Independent <i>t</i> -tests of Subscales of MFA related to Fetal Movement...	70
28. Independent <i>t</i> -tests of Subscales of MFA related to Gravida.....	72
29. Independent <i>t</i> -tests of Subscales of MFA related to Maternal Age.....	73
30. Independent <i>t</i> -tests of Subscales of MFA related to Marital Status.....	74
31. Independent <i>t</i> -tests of Subscales of MFA related to Education.....	75
32. Independent <i>t</i> -tests of Subscales of MFA related to Income.....	76
33. Cronbach's Alpha Reliability Coefficient on MFA Attachment Scale.....	77
34. Observation Table	80
35. Maternal Statements and Written Comments	81

CHAPTER I

INTRODUCTION

Background and Justification of the Study

“Here is my secret” declared the Little Prince in the book, The Little Prince by Antoine de Saint-Exupery. “It is only with the heart that one can see rightly; what is essential is invisible to the eye...” (Saint-Exupery, 1943, p. 73). Is this a statement that sonographers and other medical professionals need to develop into their repertoire of learning? What actually happens in the obstetrical exam room? What does the mother see with her heart that perhaps we miss as the medical professional? Does the dimly lit room encompass the humanity of the beginning of life? What is the additional value of the obstetrical ultrasound in terms of the human phenomenon that occurs? The merit of this exam extends beyond the anatomic fetal survey to encompass a sense of mystery and intense passion evolving around the world of the fetus.

What actually occurs during the fetal ultrasound? Does the sonographer transform the fuzzy image in shades of black and white from fetus to baby? The conglomeration of figures slowly becomes the tie that bonds. The baby turns his or her little face towards the screen and peers out into the world, as if to greet those who love him. It is all so very real. Words are spoken: “this is baby’s face, foot, arms, and legs; here is baby’s heart beating.” The mother’s face is fixed to the monitor. Her hand reaches up to touch the screen. A smile of contentment and love adorn her face. A peaceful serenity and contentment fill the room. What is truly occurring? What is the strange creature we call the Obstetrical Ultrasound Exam?

Looking at maternal-fetal bonding and its implications towards changing maternal health behaviors, thus improving neonatal outcomes, opens the door to exploration of the controversial issue surrounding routine ultrasonography. In 1993 the famous RADIUS (Routine Antenatal Diagnostic Imaging with Ultrasound Study) study was published in the New England Journal of Medicine. This study advised against routine ultrasound unless there was a valid medical reason (Mann, 1997). The RADIUS Study felt that while fetal ultrasound does permit more accurate dating, the “screening ultrasound” does not detect a significant number of anomalies to prove to be cost effective. There appeared to be no advantage in low-risk pregnancy. Seeds, stated “the analysis of the RADIUS data appeared to suggest bias by underestimating the diagnostic sensitivity of ultrasound for major anomalies and de-emphasizing those statistically significant obstetrical benefits that were recorded” (Seeds, 1996, p. 814). Is there more to be considered in the prenatal ultrasound exam than anomalies? What are the *other* benefits? Could neonatal outcome be improved through the use of ultrasound as a means of maternal-fetal bonding and attachment? When the mother views her fetus as her baby and recognizes this tiny human being as an individual, could her dietary habits improve? Does smoking decrease or even cease? What about alcohol use—does ultrasound have an impact on this also?

This study incorporates the impact of the visual display of a mother’s baby and the interaction of mother-sonographer in terms of maternal behavior changes during the fetal ultrasound. The educational process surrounding the

visualization of one's own baby during an ultrasound examination accelerates maternal-fetal bonding as is evidenced by the mother's improved health practices that include better nutrition and decreased consumption of nicotine and alcohol. A review of the literature shows variable responses to the impact of the obstetrical ultrasound, ranging from improved health behaviors to negative impacts termed as "diagnostic toxicity." (Lumley, 1990, p. 216). This study will examine the educational process and actual visualization of the obstetrical ultrasound and its contributions to improving health care outcomes for patients, which may lead to decreasing maternal and perinatal morbidity. The fetal ultrasound can be integrated into the obstetrical health care environment broadening the level of healthcare and providing quality and effective outcomes. Not only is it essential for the health of the unborn baby, it adds to the well being of the mother.

The rationalization behind this is that, when you are pregnant, everything you do can have an effect on your baby. What the pregnant mother does can affect the rest of that child's life. The fetal ultrasound itself is significant because the experience provides an "inner reassurance" and love only a mother can feel. The experience or educational process in the ultrasound room leads to maternal-fetal bonding that is important to the attachment process, producing a loving relationship that has a far-reaching impact. The ultrasound procedure along with the verbalization that occurs accelerates the learning curve for the participant. This, in turn, promotes healthy behaviors thus decreasing maternal and perinatal morbidity. Prenatal statistics show that early prenatal care reduces the chances

of premature delivery, low birth weight babies complications in childbirth and some birth defects. It should be the goal of healthcare professionals to offer the highest quality care with compassion and concern for all patients.

Statement of the Problem

The purpose of this study is to determine the level of correlation between the obstetrical ultrasound and accelerated maternal-fetal bonding as measured by the Cranley Maternal-Fetal Attachment Scale. Additionally, does this maternal-fetal bonding or attachment have an impact on maternal dietary habits as well as the consumption of nicotine and alcohol as measured by a researcher-developed questionnaire? In the process, it should promote an awareness of diagnostic techniques, specifically the obstetrical ultrasound exam, for optimal management of pregnancy and improved neonatal outcome. The significance of this study may be as simple as a matter of raising consciousness or as complex as providing improved maternal behavior resulting in healthier children in future generations. The author is compelled to add her small contribution to the process engendering an understanding of the positive significance this diagnostic tool has. By broadening the knowledge and experience in maternal-fetal bonding and its impact, we advance the cognizance of the value of this diagnostic mechanism. Ultrasound is a powerful intervention that is capable of changing health behavior because of accelerated maternal-fetal bonding.

The pedagogical sequence that occurs during the obstetrical ultrasound exam will contribute to improving health care outcomes for patients, assuring the highest quality of care for the patient. The fetal ultrasound provides a one-to-one consultation focus with the fetus as the individual and the mother the spoke person. The fetal ultrasound itself is significant because the experience renders a solace and personal consciousness and contentment that reaches the mother's inner being in addition to the medical benefits of anatomical survey of the fetus. Will the experience or educational process in the ultrasound room lead to maternal fetal bonding that is important to the attachment process, producing a loving relationship? The idealization is connected to the recognition that mothering is an eminently significant

function. Healthy attachments between mother and infant result in trusting adults, nurturing parents and responsible people.

A review of the literature demonstrates mixed reviews regarding the relationship during pregnancy between obstetrical ultrasound exam and the mother's attachment to the fetus. A greater sensitivity of attachment to the fetus was felt among mothers who received ultrasound exams that included educational comments from the sonographer. (Kohn, Nelson, Weiner, 1980). Further studies showed that ultrasound exams have a "significant psychological effect on parental attitudes toward each other and the fetus" (Zlotogorski, Tadmor, Rabinovitz, Diamant, 1997). Conversely, another researcher reported "diagnostic toxicity" accompanied by feedback that occurred as "slips of the tongue and incorrect diagnosis or improper statements by the sonographer (Lumley, 1990). With the equivocal findings, it is necessary to establish a correlation between maternal-fetal bonding and the obstetrical ultrasound exam though the use of the Cranley Maternal-Fetal Attachment Scale. Research, furthermore, indicates that maternal-fetal attachment is related to improved health practices and a mother's compliance with health regimens recommended during the pregnancy (Reading, Cox, Sledmere, Campbell, 1984). Therefore, the research hypothesis for this study is that pregnant women who have obstetrical ultrasound exams will demonstrate a change in health practices during the pregnancy in relation to nutrition, smoking and alcohol use as measured by the use of a researcher-developed questionnaire.

Null Hypothesis

There is no statistically significant correlation between the educational process surrounding the visualization of one's unborn baby during an obstetrical ultrasound examination and maternal-fetal bonding as is evidenced by scores in the Cranley Maternal-Fetal Attachment Scale. No statistically significant changes in maternal nutrition, smoking or alcohol use will correlate with the obstetrical ultrasound as is measured by a researcher-designed questionnaire given before and after the ultrasound. Ultrasound lays the foundation for a successful mother-child relationship. However, does it significantly have an impact? With improved maternal fetal attachment, one recognizes the benefits of improved health behaviors. Good nutrition, eliminating smoking, and alcohol use during pregnancy are only common sense behavior that may need

reinforcement in the lives of some people. The obstetrical ultrasound emphasizes the need for this---the fetus becomes THEIR unborn baby

Definition of Terms

For clarity of understanding, the following terms need to be defined:

Diagnostic Toxicity – is a term used by Lumley (1990) to describe the negative impact of the obstetrical ultrasound scan produced by incompetent healthcare providers during the procedure itself. Lumley refers to it as “slips of the tongue” or “incorrect diagnosis identification of structures that cannot be deciphered and language that is unfamiliar and alarming to mothers.”

Maternal-fetal bonding is considered a closeness or deep acceptance of the fetus by the mother. It has been suggested that prenatal attachment has a positive influence of postnatal mother child relationships, and improved mental health of the child (Muller, 1996). Cranley, in her development of a tool for a measurement of this attachment, related that evidence suggests that there is a qualitative change in the mother’s relationship with her baby that begins with conception and the knowledge that she is indeed pregnant (Cranley, 1981).

Maternal nutrition encompasses definite guidelines in relation to a healthy pregnancy. Good eating habits have even greater significance when you are pregnant. A pregnant woman requires 300 more calories per day to maintain her weight. She requires a well-balanced diet of carbohydrates, proteins, fats, vitamins and minerals. A suggested daily serving guide is as follows:

- Breads, cereals and other whole grain products 6 –11 servings
- Fruits, 2 –4 servings

- Vegetables, 3 – 5 servings
- Meat, poultry, fish and alternates, 2 – 3 servings
- Milk, cheese, and yogurt, 4 servings
- Fats, sweets and alcohol – Limit fats and sweets and avoid alcoholic beverages

From U.S. Department of Agriculture Home and Garden Bulletin No. 232-8.

An obstetrical ultrasound exam is a diagnostic tool used to view the fetus during pregnancy by the use of high-frequency sound waves. The sound waves are reflected off the various densities of internal organs, and decoded to create pictures of the fetus and adnexa on a monitor. The type of ultrasound used during pregnancy is real-time, which actually creates still pictures in a rapid succession to show motion of the fetus as it occurs. Routine protocol consists of views of anatomic features as well as a thorough search for detail of any abnormality in anatomy. This consists of fetal skull and intracranial anatomy , face, heart and chest, abdomen, kidneys, spine, extremities, placenta, amniotic fluid, uterus and other structures.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter reviews the literature relevant to the development and influence of the significant interactions between mother and fetus during the ultrasound exam. It begins by including an elementary definition of the obstetrical

ultrasound exam in clinical terms. This section offers a more thorough examination of some of the major articles important to this study in areas of not only bonding but maternal nutrition, smoking and alcohol use. The literature regarding this envelopes significant data in terms of psychological and cultural impacts, all of which are explored.

The Obstetrical Ultrasound Exam

Research continues to mount regarding the significant impact of ultrasound on the field of obstetrics. It continues to be used as a source of debate in both political and moral debates; it has enhanced fetal diagnosis, genetic testing and prognosis. “The embryo is now perceived as an individual, influencing patients’ attitudes towards various methods of prenatal diagnosis” (Jauniaux, 1997, p. 15).

Ultrasound itself can be defined as sound with a frequency of greater than 20,000 Hz, which cannot be detected by the human ear. Ultrasound emits intermittent high frequency sound waves through a transducer that is applied to the mother’s abdomen. The pulsed ultrasound beam is transmitted through the body where it is reflected off the various densities of human tissue, returned to the transducer that in turn receives these generated pulses. The image from these pulses is produced on the monitor screen. Since sound waves do not travel well through air, an ultrasound gel is applied to the maternal abdomen. Today’ ultrasound machines provide “real-time” ultrasonography, which produce pictures of the motion of the fetus as they actually occur. Fetal

movement, heart motion, opening of mouth, (appearing as talking, yawning swallowing) fetal breathing, and blood flow can all be viewed. Frank A. Chervenak, professor of obstetrics and gynecology at Cornell University Medical college in New York feels: "All pregnant women should have access to ultrasound because it is the best tool that we have to pick up many fetal abnormalities" (Mann, 1997, online). Indications for fetal ultrasound include: estimation of gestational age, abnormal vaginal bleeding, unreliable dates, fetal growth, inability to hear fetal heart tones, pregnancy location, suspected multiple gestation and assistance with diagnostic procedures such as chorionic villi sampling or amniocentesis. In late pregnancy, ultrasound is used to determine fetal well being, the amount of amniotic fluid, fetal position and estimated fetal weight.

The RADIUS Study

It is a well-known and often stated fact by the American College of Obstetrics and Gynecology, that routine ultrasound is not cost effective and does not appear to influence neonatal outcome. Insurance companies require valid indications for fetal ultrasound before they will compensate for the procedure. It would be unrealistic for one to believe that all problems can be detected by ultrasound, although the idealistic goal holds a challenge for today's sonographer. The sensitivity of the ultrasound is dependent upon a number of factors: fetal gestational age, fetal position, full maternal bladder, and maternal body habitus, the type of ultrasound equipment and the skill and expertise of the

operator. In 1993, the famous RADIUS (Routine Antenatal Diagnostic Imaging with Ultrasound Study) study was published in the New England Journal of Medicine. This study is forever quoted as advising against routine ultrasound unless there is a valid medical reason for the test (Mann, 1997). The RADIUS study felt that while fetal ultrasound does permit more accurate dating (valid indication), the “screening ultrasound” does not detect a significant number of anomalies to prove to be cost effective.(Ewigman, Crane, Frigoletto, LeFevre, Bain, McNellis, the RADIUS study Group, 1993, p. 821). There appeared to be no advantage in low-risk pregnancy. A new European study, the Eurofetus Study, reports an increased pick-up rate of fetal anomalies using routine ultrasound exams, where universal screening is an accepted mode of prenatal care (Levi, 1998, p. 191). Seeds, in his study, “The Routine or Screening Obstetrical Ultrasound Examination”, states “the analysis of the RADIUS data appeared to suggest bias by underestimating the diagnostic sensitivity of ultrasound for major anomalies and de-emphasizing those statistically significant obstetrical benefits that were recorded” (Seeds, 1996, p. 814). The forthrightness is most intensely stated in an article in the Medical Tribune: “More ammunition may be needed to reverse the anti-ultrasound trend set by the 1993 Routine Antenatal Diagnostic Imaging with Ultrasound Study (RADIUS)” (Mann, 1997, online). Is there more to be considered in the prenatal ultrasound exam than anomalies? What are the *other* benefits and could these *other* benefits serve as “ammunition?” Could neonatal outcome be improved through the use of ultrasound as a means of maternal-fetal bonding and attachment? When the

mother views her fetus as her baby and recognizes this tiny human being as an individual, could her dietary habits improve? Does smoking decrease or even cease? What about alcohol and drug use—does ultrasound have an impact on this also? The value of the obstetrical ultrasound needs to be explored in terms of benefits in the area of psychological reassurance and bonding.

The Educational Process in the Ultrasound Exam Room

The educational process that occurs during the obstetrical exam is an interaction that instills current scientific knowledge, clinical experience and the visual impact of the unborn baby. Lumley referred to the educational process in her research as “sonographer feedback” (Lumley, 1990, p.216) and felt it was a critical factor since it accounted for discussion, explanation and interpretation of the ultrasound images. Lumley (1990) reports on ultrasound and bonding through a historical study looking at the total picture of maternal-fetal bonding. Her conclusions center on the facts that again sonographers play a major role in the impact of the obstetrical ultrasound. She alludes to the fact that it can also have a negative impact in the form of “slips of the tongue incorrect diagnosis identification of structures that cannot be deciphered and language that is unfamiliar and alarming to mothers.” She referred to this as “diagnostic toxicity” of the obstetrical ultrasound (Lumley, 1990, p. 216).

The educational process itself stimulates learning by stirring interest, intrigue and bonding and thereby accelerating the learning curve. It initiates improvements. The ultrasound room could be considered an interactive teaching

environment where significant discussion with questions and answers occur. The ultrasound machine is enhancing the learning process, with its state-of-the-art technology in audio and video capabilities. The mother influences both the structure and content of what she will learn. The sonographer strives for excellence in the academics and other aspects in the promotion of a healthy pregnancy. This educational process results in implemented change in improved lifestyle and nutrition effecting the outcome of the newborn. The fetal ultrasound exam offers the realization of pregnancy. The photograph or image the mother receives of her fetus (baby) becomes a record of the beginning. The ultrasound pictures are referred to as "baby pictures." Parents talk of putting them on their Christmas cards and ask for extras for grandparents. These photos are the beginning of many photo albums in their lives. With parents so engrossed in this learning environment, it is an opportunity to educate patients and their families. Does this realization through the educational process of the ultrasound involve a change in health-related behavior? It is Basler's assertion, in his article, "*Patient Education with Reference to the Process of Behavioral Change*", that "behavioral change is a non-stable condition with distinct stages called precontemplation, action, and maintenance. There may be relapse at any stage and this should be interpreted as a natural part of the change process" (Basler, 1995, p. 93). It is with growing interest that this author proposes the possibility of the fetal ultrasound as the "precontemplation stage of change."

With the "educational process" involved in sonography, consequence is put upon the professional capabilities and educational background of the

individual performing the exam. The sonographer could have either a negative or a positive influence. The quality of the ultrasound procedure both physically and psychologically lies in the hands of the person executing the exam. Other researchers have referred to this negative impact as “diagnostic toxicity.” Professional standards for sonography need to be reviewed and maintained. The challenge into today’s intense health care market is to maintain high quality care through continued education and maintenance of academic standards. Professionals need to acquire and persevere in skills leading to problem solving, communication, excellence in sonography and prenatal care, as well as be committed to life-long learning. A study done over fifteen years ago emphasized the need for high quality education in sonography with a noted correlation. The authors suggested a demonstration of “positive attitudes toward the scan and fetus contingent upon receiving high feedback, suggesting that feedback should become an integral part of scanning procedure if the therapeutic potential of ultrasound in antenatal care is to be realized” (Reading and Cox, 1981, p. 245).

The Psychology of Ultrasound

Viewing and reflecting on the psychological implications of the obstetrical ultrasound brings consideration of new terminology into focus. The author believes that the possibility of new nomenclature should be added to our existing vocabulary, -- Ultrasound Psychology. The definition of psychology is “the

science of mental processes and behaviors” or “the science of the human soul” (American Heritage Dictionary, 1982, p. 1000). Behavioral processes such as verbal and non-verbal communication and conscious and unconscious thoughts entail actions and conduct in an assortment of environments, including the ultrasound exam room. The processes that can be observed during the fetal exam include speech (oohs and ahs), gestures (touching the ultrasound monitor) and expressions of thoughts and dreams. The procedure is facilitating the mother’s journey through motherhood. Research indicates that “routine” ultrasound exams may have significant psychological effects on parental attitudes toward each other and the fetus (Zlotogorski, Tadmor, Rabinovitz & Diamant, 1997). During these years leading into a new millenium, humanity is witnessing profound changes at breath-taking speeds in the field of technological advances. We are seeing the consequences of this technological development and sophistication, because the essence of human nature remains the same. Proposing the term “ultrasound psychology” opens the door to discovery of a new thought process about a scientific procedure that involves a deeply personal aspect of humanity. At the dramatic moment the ultrasound captures the beginning of life, the psychology of ultrasound grows and changes.

An Anthropologist’s View---Janelle Taylor

This research would not be complete without a short commentary on Janelle Taylor, a noted anthropologist, and some of her rationalizations on the cultural impact of ultrasound in today’s world. She vividly portrays the experience of the obstetrical ultrasound exam with all its psychological and

emotional implications (Taylor, 1992). She first became interested in the fetal ultrasound when she viewed the videotape, *The Silent Scream* (an anti-abortion video) and the advertisement for Volvo automobiles. It was at that point that she realized that the obstetrical ultrasound had become a routine part of prenatal care and an anticipated event in pregnancy (Craig, 1996). She continued her quest for knowledge about this new cultural occurrence with a research project that delved into the hopes, fears, and expectations of the ultrasound exam. In her interview with Marveen Craig, Ms. Taylor poignantly summed up her feelings on the psychological implications of the obstetrical ultrasound exam: "To see the image of her expected baby on the screen can make a woman feel very happy, and to be told that the ultrasound examination seems to indicate that all is normal can make one feel very much relieved. Because these are not physical effects, they are then glossed as 'psychological' benefits. Although it's not strictly speaking, an approved indication, some practitioners, apparently even consider 'psychological benefits' alone sufficient reason to order an ultrasound examination" (Craig, 1996, p. 187). The social and cultural context then relates to the concept of *psychological benefits*, which necessitates two different subjects: reassurance and maternal-fetal bonding. Her continued efforts to reflect on fetal ultrasound in today's society will resound again.

Impact of Ultrasound on the Abortion Issue

Ultrasound has become a powerful tool for those interested in the battle between anti-abortion and pro-choice advocates. It is dramatically displayed in

the anti-abortion film produced by obstetrician Bernard Nathanson entitled *The Silent Scream* (Ruiz & Murphy, 1992). This array of video pictures is now available on the Internet with a disclaimer that it is not intended for children. It entails the unforgettable image of a fetus with its mouth wide open during an abortion, as if it is screaming out in pain. Once viewed, the impressions stay with you.

The lasting effects of the intense impact of the fetal ultrasound are most poignantly stated in a quote from an excerpt that was in a medical column: (Ruiz & Murphy, 1992, p. 272).

“I probably shouldn’t have looked at the grainy, black-and-white ultrasound images of our baby snuggling down in the womb. The whole point of the test after all, was to find out whether he was genetically flawed so that we could decide whether to abort him. Those images could only make the decision an agony. We had barely discussed whether to have the test. The implications didn’t sink in until I saw our baby moving in the womb as though trying to get comfortable. As it happened, by the time our amniocentesis results came back, we’d decided that only the most devastating possible problems could have convinced us to abort our baby.”

Opposition to Fetal Ultrasound Videotaping for Entertainment

It is necessary, at this point in the discussion, to mention about the use of fetal ultrasound videotaping for entertainment purposes. Strong objections of this exist among medical professionals, since diagnostic ultrasound is a tool used by

physicians to monitor the well being of the fetus, not a form of entertainment or big business. These “keepsake” video businesses come with the catchy names that entice the pregnant mother --- “A Womb’s Eye View: and “Romper Womb” with prices the range of anywhere from \$50 to \$250 (Paul & Nawrocki, 1997). They propose that the underlying consensus for promoting their business be in terms of the reassuring psychological benefits it lavishes upon the mother.

These businesses do not require a physician’s order, which means they can be made at any point in the pregnancy. If they are made before their medical fetal ultrasound, there is no guarantee that the fetus will be normal. What will the response be to the patient (customer)? Secondly, what about the possibility of bioeffects? This ultrasound will require additional scanning time. Although the current statement of the American Institute of Ultrasound in Medicine states that there have been no confirmed biological effects caused by exposure, new findings could arise. This is an ethical consideration. Lastly, the researcher wonders about the unsupervised non-medical use of ultrasound in relation to the educational process. Will it create false-positive and false-negative impressions? I feel this type of business devalues the field of diagnostic medical sonography, and this study by no intention supports it. Dr. Michael Tenner, President of the American Institute of Ultrasound In Medicine (AIUM) expressed his views: “To state things simply and bluntly, diagnostic ultrasound is a valued medical tool, not a device for casual entertainment and exploitation” (Craig, 1995, p. 211).

Maternal-fetal Bonding and Attachment

Attachment of the mother to the fetus denotes a feeling of closeness and an acceptance of the fetus by the mother. The prenatal attachment process has been described in stages that correlate well with the trimesters of pregnancy (Klaus & Kennel, 1976). The mother's growing awareness and acceptance of her fetus as a separate individual – her baby, marks the first stage or first trimester. The second trimester stage begins with the mother's awareness of fetal movement. The final stage occurs in the third trimester and is marked by dreams and fantasies about the baby. This stage sees the mother preparing for the arrival of her baby. The obstetrical ultrasound exam assists in the attachment process accentuating the individuality and separateness of the fetus.

It is of utmost importance that a mechanism evolves that ensures the formation of a strong social relation in early life between mother and child. The care of the child should be located in the context of a strong commitment on the part of some adult, preferably the mother. The term “bonding” is used to represent this commitment. It has been suggested that women who bond early to their fetus (baby) respond differently. The same positive consistencies present in study after study, no matter what the nationality. It has been shown that up to three years later, “bonding mothers are acting more attentive, enthusiastic and supportive” (Verny & Kelly, 1981, p. 150). In a study of these same mothers one-year after birth, some researchers have found that they were more affectionate with more touching, holding and stroking of their children. Again, at two years of age, these same mothers were talking differently to their children with little

shouting but rather with love and respect that enriched their development through nurturing (Verny & Kelly, 1988).

One of the pioneers in studying the effects of obstetrical ultrasound on maternal-fetal bonding was Mecca S. Cranley in 1981. To obtain adequate and reliable data in relation to this, she developed a 24-point scale to measure the attachment process during pregnancy, which has become known as the Cranley Maternal-Fetal Attachment Tool. Her findings support the existence of maternal-fetal attachments behaviors and “evidence indicates that social support enhances” these feelings with the contrary or stress hindering them. The reliability and validity of the instrument has proven to be satisfactory.

Substantial research advocates the importance of maternal attachment in the development of the role of the mother, the relationship of mother and infant, and the well being of the child. Mecca S. Cranley, with the assistance of Susan M. Heidrich (1989), studied the effects of not only the fetal ultrasound, but included the perception of fetal movement, and amniocentesis in relation to attachment. It was noted that women who reported feeling fetal movement early in pregnancy had higher scores on the attachment assessment tool. In this study, it was reported that the ultrasound had no impact at all. An interesting and understandable finding was that women who had undergone amniocentesis had lower attachment scores before the procedure, but one month later were equal to those of other women at the same gestation.

Also in 1981, Anthony E. Reading and David N. Cox began studying “The Effects of Ultrasound Examination on Maternal Anxiety Levels.” They looked at

pregnant women both before and after the obstetrical ultrasound, and found a significant positive attitude change in those in “high feedback” sonographer groups. The results of this study demonstrate an important concept for the profession of sonography in terms of the suggestion that sonography-mother feedback is a necessary component in the interaction for any therapeutic effects in the prenatal period.

Continuing in the 1980’s, we see the names Fletcher and Evans (1983) becoming prominent in the field of maternal-fetal attachment. They reported that mothers noted a “bond of loyalty” between themselves and their fetus following the ultrasound. They wrote of their reflections during this poignant time of fetal ultrasound scanning, suggesting acceleration in the bonding process. Mothers begin to recognize the fetus as their baby and separate as an individual. They proposed that this attachment could result in changes in feelings of opposition, in favor of the fetus, resulting in fewer abortions.

In relation to this study, Lisette Bralow (1983) reported the often quoted letter in the New England Journal of Medicine, that this reported “strengthened bond of loyalty” can prove beneficial to the fetus by reducing harmful behaviors of the mother. The suggestion was made for routine fetal ultrasound examinations.

A study by Lumley on maternal-fetal bonding suggested that ultrasounds done early slightly improve bonding but those done after awareness of fetal movement do not. Short-term effects on the mother’s health behaviors including less smoking and consumption of alcohol were detected. This study also suggested that women’s anxiety was actually increased during the exam and then

reassured by positive feedback from the sonographer. Not all mothers considered scans reassuring: it appeared to be dependent upon the mother's personal and social history (Lumley, 1990).

Suppressed prenatal attachment may influence adaptation to the course of the pregnancy and ultimately affect postpartum attachment. This could have long-term consequences. A recent research article suggests that disorders of maternal affection and behavior result from "an early process of mother-to-infant bonding which can go seriously wrong." (Kumar, 1997, p. 175). Looking at another study done linking mental illness and disorders of maternal bonding, we can read "Parental Bonding as a Predictive Factor for the Development of Adult Psychiatric Disorder." This study used the Parental Bonding Instrument (PBI) in its assessment process, with its conclusion as follows: "The results confirm previous suggestions from single studies that the perceived parental style by the PBI can be considered a good predictor for the presence of psychiatric disorders excluding panic attacks, avoidant personality disorders and unipolar affective disorders" (Favaretto & Torresani, 1997, p. 124). The idealization of motherly love is connected to the recognition that mothering is a vitally important function. Infants grow into children who benefit from responsible, loving care and are more likely to grow into responsible, caring adults.

Fletcher and Evans related the ultrasound image to that of the "fetal form" and noted that it tended to foster among pregnant women a sense of recognition and individual separateness of the fetus as their own. They identified him/her as something belonging to them alone. They documented that maternal-fetal

bonding is initiated sooner and is made stronger by the practice of the obstetrical exam through the communication of the sonographer and physician. They considered this the “fundamental element in the later parent-child bond” supporting the claim the ultrasound would more likely lead women “to resolve ‘ambivalent’ pregnancies in favor of the fetus”(Fletcher & Evans, 1983, p. 392).

Improved Dietary Habits

The increased and strengthened maternal-fetal bond that results from the viewing of the obstetrical ultrasound has proven to be beneficial by reducing potentially harmful maternal behavior. It has been suggested that this enforced relationships prenatally and could enhance relationships postnatally, all of which are vital for a normal healthy child in the development of a sense of himself (Berman & Cohen, 1997). While using ultrasound as a tool to sway the mother’s behavior could be interpreted as ethically questionable, suggestions have been written by researchers. They relate the theory that all pregnant women should have high-feedback fetal sonography to influence parental adherence to prenatal care (Bralow, 1983).

Brown emphasizes the essential importance of nutrition in research that suggests “The aspects of nutrition may play a greater role in immediate and long-term health of offspring than was thought previously “ (Brown & Kahn, 1997, p.433). The educational process involved in fetal sonography can assist with improved nutrient intake. “ Maternal education was the factor most strongly

associated with nutrient intake, followed by monthly per capita income” (Weigel, Narvaez, Lopez, Felix, & Lopez, 1991, p.21).

Effects of Smoking

Two separate research studies, done as early as 1982, showed mothers are more likely to reduce alcohol consumption and smoking after a fetal ultrasound exam (Reading & Cox, 1982). A more recent survey was performed to evaluate the fetal ultrasound as a tool to help reduce smoking. The results were not very encouraging, as the estimated ability to stop smoking was low (Eurenius, Axelsson & Sjoden, 1996). This is unfortunate due to the known fact that smoking results in poor neonatal outcome with an increased risk of intrauterine growth restriction (Nordentoft, Lou, Hansen, Nim, Pryds, Rubin & Hemmingsen 1997). It has been found that by reducing the number of cigarettes smoked by at least nine per day after the first prenatal visit, mothers who smoke during their pregnancy can add 100 grams or more to their baby’s birth weight. (Secker-Walker, Vanek, Flynn, Mead, 1997). The women’s risk of delivering an infant with intrauterine growth restriction clearly increases with the number of cigarettes smoked.

A comprehensive review of the physiological effects of nicotine on mothers and fetuses includes premature birth, intrauterine growth restriction, premature rupture of membranes, preterm labor, and placental abruption, spontaneous abortion and placenta previa. Further complications listed are Sudden Infant Death Syndrome, asthma, lower IQ (5 points lower), behavior problems,

attentions deficit disorder and upper respiratory infections (Lambert and Clark, 1996). Nordentoft et al (1997) states that it is important to bear in mind that women who smoke are the least educated and have the poorest support from a social network. Can the use of the psychological effects of the fetal ultrasound have a significant impact on the changing of their negative maternal behavior? Along with the impact of nicotine, can the addiction of drugs also be affected at this time?

Effect of Alcohol Use

The association between consumption of large amounts of alcohol and/or use of drugs during pregnancy and adverse fetal outcomes is well documented (Shu, Hatch, Mills, Clemens, & Susser, 1995). “The unborn is most vulnerable to their (drugs) toxic effects early in pregnancy and that even small amounts of any drug, including common over-the-counter ones such as aspirin, can be harmful to him” (Verny & Kelly, 1981, p. 94). The dangers of drugs and alcohol goes back to the times of the early Greeks and Romans who noted that “mothers who were heavy drinkers bore a much higher rate of deformed and sickly children” (Verny and Kelly, 1981, p. 92).

Studies have shown that “social support may be an important predictor of alcohol consumption both prior to and during pregnancy” (Stephens, 1985, p. 344). Alcohol has long been associated with adverse fetal outcomes, but the variables related to the alcohol consumption were relatively neglected. In 1985, Stephens’s findings suggested that social support might be an important

predictor of alcohol consumption. Can this social support be enhanced through the attachment process of the fetal ultrasound? An additional variable appears to be whether the pregnancy was planned or unplanned. Women who wanted their pregnancies were less likely to smoke cigarettes or partake of alcohol during their pregnancies (Altfeld, Handler, Burton & Berman, 1997).

In summary, these articles highlight the important key to changing negative maternal behavior in terms of enhancing social support through relaying lasting impressions of attachment to both the mother and other viewers of the obstetrical ultrasound. The authors, Verny and Kelly speak of “physiological communication” between mother and child and qualify the terminology with smoking, excessive drinking, drug taking and eating improperly as forms of the communication. “The harmful changes these substances can produce in the unborn’s environment may make him fearful like smoking and , I suspect also, drinking---but then, he has every reason to be worried (Verny & Kelly, 1981, p. 91). The ethical persuasion of changing maternal behaviors in relation to these lifestyles stands in question, yet holds substantial value. It deserves a rigorous scientific investigation with a valid instrument of examination.

Summary

In summary, these articles highlight the important key to changing negative maternal behavior in terms of enhancing social support through relaying lasting impressions of attachment to both the mother and other viewers of the obstetrical ultrasound. The ethical persuasion of this stands in question, yet hold

substantial value. It deserves a rigorous scientific investigation with a valid instrument of examination.

All of the publications dealing with this topic are emotionally laden with appeal to parenthood, presenting material that renders a strong sense of loyalty and passion. This emotional response to the ultrasound highlights a sensitive perspective and a heightened understanding. One author synopsised it with a mere sentence. "The predominant emotional response to sonography was enhanced awareness and personal knowledge of the baby in utero, together with a sense of increased emotional attachment and further desire to relate to the baby"(Milne & Rich, 1981). Janelle Taylor noted anthropologist and anti-abortionist would applaud the notion. The Radius Study group has yet to learn and understand the ramifications.

CHAPTER III

METHODOLOGY

Introduction

This chapter will describe the actual procedure, including the selection of subjects under study and how they were chosen for inclusion. In addition, the instruments being used to collect information will be discussed as to their content, validity and reliability. Data collection and analysis procedures will be

presented. The chapter will conclude with some of the methodological limitations.

Subjects

Sixty-one women who were in the second trimester of a normal pregnancy participated in this study. The majority of subjects were married, with an average age of 28. This factor is a function of the average of conception and parenthood in the United States. The subjects were a convenience sample within a Women's Health Clinic that consisted of pregnant women at 18 – 22 weeks gestation with uncomplicated singleton pregnancies. This gestational age is chosen due to the fact that an anatomical survey of the fetus is accomplished at this time. The sixty-one participants were randomly chosen to participate. The randomization consisted of choosing only patients that fall within the 18 – 22 week gestational age group for the study.

Instruments

Mecca S. Cranley, Ph.D. who is currently Dean of the School of Nursing at the University of Buffalo in New York, developed the Cranley Maternal-Fetal Attachment scale. The attachment scale consists of 24 individual questions relating to maternal-fetal attachment during pregnancy answered on the Likert scale of definitely yes, yes, uncertain, no and definitely no. Content validity was built into the scale. A coefficient of reliability of .85 was established for the scale with the reliability of the subscales ranging from .52 to .73. The five subscales of the Maternal-fetal Attachment Scale are: role-taking, differentiation of self from

the fetus, giving of self , attributing characteristics and intentions to the fetus and interaction with fetus. The scores on the MFA scale were positively correlated with the amount of available social support reported by the mothers as well as their perceptions of babies three days after giving birth.

The demographic information sheet is designed to avoid extraneous variables, such as the influences of cultural perceptions, social and economic pressures, and maturity development related to age groups. Questions are carefully stated so as to not lead the respondent into giving the answer they think the researcher wants.

The researcher-developed questionnaire was programmed in such a manner to include as few as possible questions as needed to acquire the necessary data. The questions have been reviewed repeatedly so they will be interpreted in the same manner by every respondent. Each question is followed by a set of possible responses so that people need only place an X next to the response of their choice. All efforts have been made to eliminate ambiguous wording. It is impossible to guarantee that this test is valid. A preliminary check of the instrument was conducted with several people. All ambiguities and weaknesses were corrected. This questionnaire possesses face validity, which is a weak form of validity, but it should help more respondents complete it.

Ethical considerations were kept in mind with emphasis on openness of the research situation, informed consent and anonymity and confidentiality. The research was conducted in an open atmosphere with staff being made aware of the process. No physical activity that could harm the patient was taken place

intentionally. While the research was conducted, we bore in mind that we are still nurse and sonographer with responsibilities to fulfill. Coding of subject information was handled in a confidential manner at all times.

Procedure

The study was conducted in the mid-western, metropolitan area of largely middle and upper middle class white, American mothers in the summer of 1999. Prior to the ultrasound procedure, all patients were requested to answer the health habit questionnaire and the Maternal-Fetal Attachment Scale. Data was collected for the maternal-fetal bonding issue as well as responses regarding nutrition, alcohol and smoking. The obstetrical ultrasound was performed by the sonographer and read by the obstetrician. The ultrasound monitor was visible to the mother at all times, as the sonographer familiarized the observers to the basic anatomy of the fetus as well as maternal anatomy as was appropriate. Conversation was encouraged and relaxed. Immediately following the obstetrical ultrasound, the mothers were asked to reply to the Cranley Maternal-Fetal Attachment scale again. The MFA is used to measure maternal-fetal bonding and consists of a 24-item Likert scale with responses numbering in the range of 1 to 5. The health habit questionnaire or pre-test consists of multiple choice questions relating to dietary habits, smoking and alcohol consumption. This is a researcher-developed instrument. A post-test (a repeat of the health habit questionnaire) was administered in a four-week interval to see if the ultrasound has made a statistical difference in the mother's dietary habits, alcohol or nicotine consumption. The results were analyzed and compared to see if any statistical significance exists. After a four-week period following the ultrasound, does the mother's nutritional status improve? Did less smoking and alcohol consumption occur?

The researcher feels it is essential to develop a qualitative or observational component into this study that would look at such physical reactions as facial expression, movement, ideas, verbal reactions and their relationship to maternal feelings. A second sonographer was in the ultrasound exam room at the time of the ultrasound to record such data as percentage of time mother's eyes

are on screen watching baby, expression on mother's face, mother's movement toward screen, does the mother cry, mother's speaking or disciplining fetus, does mother poke at her stomach to make her baby move, and if mother compares fetus to someone in her family. This ethnographic approach is appropriate because the researcher is interested in examining the real life situation to find out what the subjects (patients, mothers) feel and do during the obstetrical ultrasound exam. Along with the follow-up Cranley Maternal-Fetal Attachment Scale questionnaire (given after the obstetrical ultrasound exam), the mother was given a sheet where she can answer three specific questions in her own words. This form will include the following questions: Describe your feelings during the ultrasound. What do you remember most about your ultrasound? What did you learn from the ultrasound? My intent is in the understanding of factors that may enhance and assist in the formation of positive attitudes towards improved maternal behaviors that are imparted as a result of the ultrasound itself. In addition, this small subjective integral of observation during the obstetrical exam is utilized to add detail and description to a tender and sensitive issue as well as add "depth" to the study.

Data Analysis

Demographic data is displayed in table form for easy review for the reader. Data or quotations of the respondents as well as the sonographer observations are formatted in table presentation. The data relating to maternal-fetal bonding was analyzed and statistical analysis was obtained by the use of a dependent *t* test (repeated measures pre-test, post-test design) with a standard level of significance ($p < .05$). This test can easily be used because the subjects have been used as their own control group. The change in maternal behavior involving nutrition, smoking, alcohol consumption is also be measured by a separate dependent *t*-test (repeated measures pre-test, post-test design) This test looks at the initial differences between the pre-test and post-test data.

Statistically different means will be calculated and analyzed. A certain degree of probability can exist, but it can be assumed that the change in both maternal-fetal bonding and maternal behavior changes could be due to the ultrasound exam. Reliability testing was established through the use of Cronbach's alpha coefficient of reliability.

Limitations

The researcher has identified several limitations. In focusing on the maternal-fetal experience during the obstetrical ultrasound, the researcher is watching for the demonstration of a specific "feeling", which in it may be considered a subjective view, rather than the gathering of any objective data. It is difficult to interpret social interactions with any concrete method.

The subjects (pregnant women with singletons at 18 – 22 weeks' gestation) are not randomly chosen, because they are naturally occurring. They are a convenience sample in a Women's Health Clinic. Their appointments are randomly made based on gestational age. Since it is rare to find a patient with no ultrasound exam at all, there is a lack of a control group for the nutritional, smoking and alcohol component of the study. The researcher would like to attempt to organize such a group, but feel it will be a futile endeavor. It is difficult to develop a control group if the population does not exist, and one cannot withhold treatment for the purpose of a study.

Also, in relation to the subjects, there is a limitation in the study in terms of similarity of the participants. Most of the women will be employed, married,

white, and middle class. This research could be repeated with other groups of pregnant women in various educational, income, employment, and marital and professional characteristics. Different populations with lower socioeconomic groups and stratifications would assist in showing pronounced effects on a specific sub-group.

This study entails an educational process that occurs in a specific ultrasound exam room. In reality, every exam room and every sonographer is very different, not only because of the innate protocol of clinics and hospitals, but because we are all very unique human beings, responding to patient need in our own way.

It is also impossible to isolate the total effect of the ultrasound alone on the maternal behavior change. Multiple factors exist during a pregnancy that could account for change: prenatal classes, peer and family influence, counseling from health professionals, television and books, as well as the physical changes occurring during the pregnancy.

This chapter has discussed methodology for this research study. The following chapter will include the survey results and a discussion of those findings. The final chapter will summarize the study, draw conclusion for the results of the survey and state further recommendations.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

This chapter presents the results of the research involving maternal-fetal bonding and the obstetrical ultrasound in relation to maternal health habits, in particular smoking, and nutrition and alcohol consumption. The demographic information and statistics will be presented first. Data collected on each part of the research hypothesis will then be given. The discussion section will present the findings produced by this study and relate it to the literature review.

Demographic Information

This convenience sample within the Women's Health Clinic that consisted of 61 pregnant women at 18 – 22 weeks gestation with uncomplicated, singleton pregnancies displays demographics that could be further analyzed into subgroups. The entire sample excluded high-risk pregnancies in order to ensure homogeneous results that can be compared and judged more fairly. It was important to study the effects of scanning on normal obstetrical patients before looking at its psychological impact in complicated pregnancies. Demographic information was viewed in terms of: age of mother, marital status, ethnicity, education, annual gross income, planned or unplanned pregnancy, history of miscarriages, history of birth defects, fetal movements and number of pregnancies.

Age of Mother

In this survey, the age of the subjects was divided into six categories. All of the categories were represented with the mean age of 28. The majority of the respondents (n=19, 31.1%) were 31 – 35 years old. Eighteen respondents (29.6%) were 26 – 30 years old, 15 respondents (24.6%) were 20 – 25 years old, four respondents (6.4%) were 19 or younger, three respondents (4.9%) were 36 – 40 years old and two respondents (3.2%) were 41 years or older. Table 1 represents the computed results.

Table 1: Age of Mother

Age Level	Frequency	Valid Percent
19 or younger	4	6.4
20 – 25 years old	15	24.6
26 – 30 years old	18	29.6
31 – 35 years	19	31.1
36 – 40 years	3	4.9
41 years or older	2	3.2
Total	61	100.0

Marital Status

Respondents were asked to indicate their marital status. In the survey, the categories that included separated, divorced or widowed were not represented. The majority of respondents (n= 42, 68.9%) were married. Seventeen respondents were single and two were engaged to be married. See Table 2.

Table 2: Marital Status

Marital Status	Frequency	Valid Percent
Married	42	68.9
Single	17	27.9
Other/Married Soon	2	3.3
Total	61	100.0

Ethnicity

Respondents were asked to indicate their race in one of the following categories: African-American, Asian, Caucasian, Hispanic, Native American or Other. The majority of respondents (n = 54, 88.5 %) were Caucasian. Two (3.3%) respondents were African-American, two (3.3%) respondents were Asian, two (3.3%) respondents were listed as Other, one (1.7%) respondent was Hispanic and Native Americans were not represented.

Table 3: Ethnicity

Ethnicity	Frequency	Valid Percent
Caucasian	54	88.5
African-American	1	1.7
Asian	2	3.3
Other	2	3.3
Hispanic	1	1.7
Native American	0	0.0
Missing	1	missing
Total	61	100.0

Level of Education

Table 4 reflects the level of education for the subjects of this study. The education level was well-distributed with nine respondents (14.8%) with Master degrees. Fifteen (24.6%) respondents held a Bachelor's degree, five (8.2%) had some college, 10 (16.4%) respondents attended technical college, 21 (34.4%) respondents graduated from high school, and one (1.6%) respondent completed elementary school. Of note is the fact that the respondent only completing elementary school was 16 years of age. See table 4.

Table 4: Level of Education

Level of Education	Frequency	Valid Percent
Elementary	1	1.6
High School	21	34.4
Vocational/Technical	10	16.4
Some College	5	8.2
Bachelor's Degree	15	24.6
Master's Degree	9	14.8
Total	61	100.0

Annual Gross Income

Respondents were asked to indicate their annual gross income. Over half (n = 31, 52.5%) indicated their income to be in the \$20,000 to \$59,999 range. Nineteen (32.2%) respondents indicated an annual gross income less than \$20,000. Eight (13.6%) respondents indicated an annual gross income in the \$60,000 - \$100,000 range, and one (1.7%) respondent indicated an annual gross income over \$100,000. See Table 5.

Table 5: Annual Gross Income

Annual Gross Income	Frequency	Valid Percent
Less than \$20,000	19	32.2
\$20,000 to \$59,999	31	52.5
\$60,000 to \$100,000	8	13.6
More than \$100,000	1	1.7
Missing	2	
Total	61	100.0

Planned or Unplanned Pregnancy

Respondents were asked to indicate if this pregnancy was planned or unplanned. The majority of respondents (n = 39, 63.9 %) indicated their pregnancy to be planned. Twenty-two (36.1%) indicated their pregnancy was unplanned.

Table 6: Planned or Unplanned Pregnancy

Planned or Unplanned	Frequency	Valid Percent
Planned	39	63.9
Unplanned	22	36.1
Total	61	100.0

History of Miscarriage

Respondents were asked if they had experienced any miscarriages. Approximately one-quarter (n = 15, 24.6%) indicated they had experienced a miscarriage in the past. Forty-six (75.4%) had not experienced a miscarriage.

Table 7: History of Miscarriage

History of Miscarriage	Frequency	Valid Percent
YES	15	24.6
NO	46	75.4
Total	61	100.0

Had Child with a Birth Defect

Respondents were asked if they had a child with a birth defect or genetic problem. The majority of subjects (n = 59, 96.7%) indicated they had not. Two respondents (3.3 %) did have a previous child with a birth defect. See Table 8.

Table 8: Previous Child with a Birth Defect

Previous Child with a Birth Defect	Frequency	Valid Percent
YES	2	3.3
NO	59	96.7
Total	61	100.0

Fetal Movement

Respondents were asked if they had or had not felt the baby move. Over half (n = 45, 73.8%) had felt fetal movement. Eleven respondents (18%) had not felt movement, and five respondents (8.2%) were uncertain. Table 9 demonstrates the computed results of fetal movement.

Table 9: Fetal Movement

Fetal Movement	Frequency	Valid Percent
YES	45	73.8
NO	11	18.0
NOT SURE/UNCERTAIN	5	8.2
Total	61	100.0

Number of Pregnancies

Respondents were asked the number of times they had been pregnant. This was the first pregnancy for over half (n = 32, 52.5%). Twelve (19.7%) respondents indicated it was their second pregnancy, seven respondents (11.5%) indicated this to be their third pregnancy, five (8.2%) indicated this pregnancy as their fourth, one (1.6%) respondent stated this was her fifth pregnancy, two (3.3%) respondents indicated this to be their sixth pregnancy and two (3.3%) respondents indicated this as their tenth pregnancy.

Table 10: Number of Pregnancies

Number of Pregnancies	Frequency	Valid Percent
1 st Pregnancy	32	52.5
2 nd Pregnancy	12	19.7
3 rd Pregnancy	7	11.5
4 th Pregnancy	5	8.2
5 th Pregnancy	1	1.6
6 th Pregnancy	2	3.3
10 th Pregnancy	2	3.3
Total	61	100.0

Section II in the survey, the Health Habit Questionnaire was designed to measure the respondents' nutrition, alcohol consumption and smoking. The 15 questions were given as a pre-test, prior to the obstetrical ultrasound, and repeated four weeks later. Table 11 represents the respondents' nutritional status both prior to the ultrasound (pre-test) and after the ultrasound (post-test). Health habits regarding regular breakfasts, variety of foods, use of prenatal vitamins and overall nutritional status appeared to show little, if any, change in valid percent of frequency during the month following the ultrasound. See Table 11.

Table 11: Nutritional Status

Question	Frequency Pre-test	Valid Percent Pre-test	Frequency Post-test	Valid Percent Post-test
1. Start Day with well-balanced meal within 1-2 hours of waking.				
_ rarely or never	9	14.8	8	13.8
_ 2 – 3 times per week	11	18	10	17.2
_ 4 –5 times per week	8	13.1	7	12.1
_ almost always	33	54.1	33	56.9
2. Eat a variety of foods from all the basic food groups.				
_ YES	57	93.4	54	93.1
_ NO	4	6.6	4	6.9
3. Take Prenatal Vitamin or Nutritional Supplement				
_ YES	58	95.1	55	94.8
_ NO	3	4.9	3	5.2
4. Percentage of nutrition you perceive you get				
_ 0 – 25%	0	0	0	0
26 – 50%	4	6.7	4	7

50 – 75 %	28	46.7	26	45.6
75 – 100 %	27	45.0	27	47.4
5. Rate Nutritional Intake during last month.				
_ Worse than usual	4	6.6	4	6.9
_ No change	19	31.1	18	31.0
_ Better than usual	37	60.7	35	60.3
_ Exceptional	1	1.6	1	1.7

Table 12 demonstrates the computed results of the dietary habits of the subjects both pre-test (before the ultrasound) and post-test (one month after the ultrasound). Slight increases are seen in the number of servings of milk products, fruits and vegetables, cereals/breads, and in meat/fish or alternatives.

Table 12: Dietary Habits

Question	Frequency Pre-test	Valid Percent Pre-test	Frequency Post-test	Valid Percent Post-test
6. Number of Servings of milk or milk products daily.				
_ 1 serving	5	8.3	4	7.4
_ 2 servings	13	21.7	13	22.8
_ 3 servings	22	36.7	22	38.6
_ 4 servings	20	33.3	18	31.6
7. Number of Servings of fruits and vegetables daily.				
_ 1 - 2 servings	20	32.8	17	29.3
_ 3 – 4 servings	33	54.1	33	56.9
_ 4 – 5 servings	8	13.1	8	13.8
8. Number of Servings of Cereals/Breads/Grain Daily				
_ 0 –1 servings	5	8.2	4	6.9

_ 2 – 3 servings	28	45.9	28	48.3
_ 4 – 5 servings	19	31.1	17	29.3
_ 6 or more servings	9	14.8	9	15.5
9. Amount of Meat/Fish/Alternatives Daily				
_ Little or no meat	5	8.3	5	8.8
_ 3 – 4 oz.	32	53.3	29	50.9
_ 5 – 8 oz.	21	31.1	21	36.8
_ 9 oz. or more	2	3.3	2	3.5

Table 13 demonstrates the change in maternal behavior involving nutrition, smoking, and alcohol consumption as was measured by a separate dependent *t*-test (repeated measures pre-test, post-test design) This test looks at the initial differences between the pre-test and post-test data. Statistical significance was noted in “starting the day with well-balanced meal within 1 – 2 hours” ($p = .05$) and in the “number of servings of fruits/vegetables daily” ($p = .05$). A trend was seen in the “number of servings of milk or milk products daily” ($p = .060$). Again, a slight improvement in milk intake is seen. In both results, mothers health habits improved from on the post-test results.

Table 13: Statistical Analysis of Health Habit Questionnaire

Item	Mean(S.D.)	Mean(S.D.)	t-	Df	2-tail
	Pre-test	Post-test	Value		Prob.
1. Start day with well-balanced meal within 1-2 hours.	3.12(1.14)	3.29(.918)	-2.20	57	.05
4. What % needed for baby do you get?	3.40(.623)	3.44(.682)	-.57	56	.568
5. Rate Nutritional Intake past month.	2.57(.652)	2.65(.762)	-.84	57	.403
6. # of servings of milk or prod. daily.	2.94(.915)	3.10(.880)	-1.92	56	.060
7. # of servings of fruits/veg. daily.	1.84(6.44)	2.01(.761)	-2.01	57	.05
8. # of servings of cereals/breads daily.	2.53(.842)	2.53(.731)	.00	57	1.00
9. Amt. Of meat/fish or alternatives daily.	2.35(.694)	2.29(.680)	.60	.56	.553

Statistical analysis can be further applied looking at the respondents in individual groups based on age, marital status, education and income. Independent groups *t*-tests were applied using these individual categories on the above items of the health habit questionnaire.

Table 14 demonstrates the independent groups *t*-tests results using the age of the respondents. Thirty-one of the respondents were 29 years old or younger while 27 were 30 or older. The Health Habit Questionnaire showed a small change in relation to nutritional status when the subjects were divided by age. Group 1 (29 and younger) appeared to eat fewer servings of fruits and vegetables, as well as fewer servings of meat and fish or alternatives than Group 2 (30 or older). A trend is noted in servings of fruits and vegetables with significance at .055. A second trend seen in the amounts of meat/fish and alternatives was noted with $p = .074$.

Table 14: Independent Groups *t*-test on Health Habits Using Age

Item	Mean(S.D.) 29 or younger (n=31)	Mean(S.D.) 30 or older (n=27)	t-Value	Df	2-tail Prob.
1. Start day with well-balanced meal within 1-2 hours.	3.22(.920)	3.37(.926)	-.59	56	.554
4. What % needed for baby do you get?	3.32(.748)	3.55(.577)	-1.31	56	.195
5. Rate Nutritional Intake past month.	2.77(.805)	2.51(.700)	1.28	56	.205
6. # of servings of milk or prod. daily.	3.12(.957)	3.07(.796)	.22	55	.826

7. # of servings of fruits/veg. daily.	1.83(.779)	2.22(.698)	-1.96	56	.055
8. # of servings of cereals/breads daily.	2.45(.768)	2.62(.688)	-.92	56	.359
9. Amt. Of meat/fish or alternatives daily.	2.16(.638)	2.48(.700)	-1.82	56	.074

Table 15 demonstrates the independent groups *t*-tests results using the marital status of the respondents. Forty-nine of the respondents were married. Nineteen were unmarried. The married respondents had significantly better nutrition habits on the post-test in relation to the four items on the Health Habit Questionnaire. Group 1 (married, $n = 42$) responded affirmatively considerably more often to the question: “Do you start your day with a well-balanced meal within 1 – 2 hours of waking.” The mean score for Group 1 was 3.46 (S.D. = .809) while the mean score for Group 2 (unmarried, $n = 18$) was 2.88 (S.D. = 1.05). The *t*-value was 2.27 with the two-tail probability at .05. Three significant items were in the categories of servings of fruits and vegetables ($p = .001$), servings of cereals and breads ($p = .05$), as well as servings of meat/fish/alternatives ($p = .001$).

Table 15: Independent Groups *t*-test on Health Habits Using Marital Status

Item	Mean(S.D.)	Mean(S.D.)	t- Value	Df	2-tail Prob.
	Married (n=49)	Unmarried (n=19)			
1. Start day with well-balanced meal within 1-2 hours.	3.46(809)	2.88(1.05)	2.27	56	.05
4. What % needed for baby do you get?	3.48(.637)	3.29(.772)	.99	56	.327
5. Rate Nutritional Intake past month.	2.63(.733)	2.51(.700)	-.32	56	.747
6. # of servings of milk or prod. daily.	3.20(.758)	2.88(1.11)	1.25	55	.215
7. # of servings of fruits/veg. daily.	2.21(.775)	1.52(.624)	3.43	56	.001
8. # of servings of cereals/breads daily.	2.65(.617)	2.23(.903)	2.06	56	.05
9. Amt. Of meat/fish or alternatives daily.	2.48(.637)	1.88(.600)	3.35	56	.001

Table 16 demonstrates the independent groups *t*-tests results using the education status of the respondents. Twenty-two of the respondents reported high-school education or less. Thirty-nine of the respondents recorded post-

secondary education. The level of education of respondents appeared to only have limited significance in the nutritional status. These trends were in the health habit questions relating to servings of fruits and vegetables ($p=.053$) and servings of meat/fish/alternatives ($p=.069$). Group 1 (high school or less, $n = 21$) appeared to eat fewer servings of these two food groups as compared to Group 2 (post-secondary, $n = 37$).

Table 16: Independent Groups *t*-test on Health Habits Using Education

Item	Mean(S.D.)	Mean(S.D.)	t-Value	Df	2-tail Prob.
	H.S. or less (n=22)	Post-secondary (n=39)			
1. Start day with well-balanced meal within 1-2 hours.	3.04(.973)	3.43(.867)	-1.55	56	.126
4. What % needed for baby do you get?	3.23(.831)	3.55(.558)	-1.49	30	.147
5. Rate Nutritional Intake past month.	2.61(.865)	2.67(.709)	-.27	56	.788
6. # of servings of milk or prod. daily.	3.28(.902)	3.00(.862)	1.19	55	.240
7. # of servings of fruits/veg. daily.	1.76(.700)	2.16(.764)	-1.96	56	.053

8. # of servings of cereals/breads daily.	2.33(.796)	2.64(.676)	-1.60	56	.115
9. Amt. Of meat/fish or alternatives daily.	2.09(.539)	2.43(.728)	-1.85	56	.069

Table 17 demonstrates the independent groups *t*-tests results using the gross income of the respondents. Nineteen of the respondents reported gross incomes under \$20,000. Thirty-seven respondents recorded an income of \$20,000 or over. The Health Habit Questionnaire showed significant results in relation to annual gross income. Mean scores for respondents with incomes of \$20,000 or over versus those less than \$20,000 were significantly higher on the questions relating to number of servings of fruits and vegetables ($p = .05$), number of servings of cereals and breads ($p = .05$) and the amount of fish/meat/alternatives ($p = .01$). A trend was displayed in the perceived perception of nutrition in the question asking “what percentage of nutrition for your baby do you get?”, with a displayed probability of .083.

Table 17: Independent Groups t-test on Health Habits Using Income

Item	Mean(S.D.)	Mean(S.D.)	t-Value	Df	2-tail Prob.
	Under \$20,000 (n=19)	\$20,000 or More (n=37)			
1. Start day with well-balanced meal within 1-2 hours.	3.00(1.05)	3.40(.832)	-1.57	54	.121
4. What % needed for baby do you get?	3.15(.834)	3.54(.558)	-1.80	26	.083
5. Rate Nutritional Intake past month.	2.52(.905)	2.70(.702)	-.81	54	.424
6. # of servings of milk or prod. daily.	2.89(1.10)	3.16(.737)	.97	26	.341
7. # of servings of fruits/veg. daily.	1.68(.885)	2.21(.630)	-2.60	54	.05
8. # of servings of cereals/breads daily.	2.26(.872)	2.67(.626)	-2.04	54	.05
9. Amt. Of meat/fish or alternatives daily.	2.00(.577)	2.51(.651)	-2.90	54	.01

Table 18 indicates the smoking assessment, both pre- and post-test, indicating respondents before and after the obstetrical ultrasound. Additionally, it

demonstrates the computed results of the respondents' alcohol consumption that were taken prior to the obstetrical ultrasound with post-test results lacking due to subject who failed to keep her prenatal visit. Unfortunately, the random selection of subjects led to the inclusion of only a single subject that admitted to alcohol consumption during pregnancy. Eight (13.3 %) of the respondents indicated that they did smoke. Fifty-two (85%) did not smoke and one (1.7%) stated that she had recently quit. Overall, there was a decrease in the number of smokers from 8 to 5, some of which were the result of failure of subjects to respond on the post-test.

Table 18: Alcohol Consumption and Smoking Assessment

Question	Frequency	Valid	Frequency	Valid
	Pre-test	Percent Pre-test	Post-test	Percent Post-test
10. Do you drink alcohol?				
_ YES	1	1.6	1	1.8
_ NO, but recently quit	7	11.7	7	12.3
_ NO	52	86.7	49	86.0
11. Number of Drinks Consumed each week				
_ 4	1	100.0	missing	missing

12. Do you smoke?				
_ YES	8	13.3	5	9.0
_ NO	52	85.0	49	87.5
_ NO, but recently quit	1	1.7	2	3.5

Table 19 represents the computed data on the respondents attempts on changing health behavior in relation to alcohol and tobacco consumption. There is only one valid case of alcohol consumption. A total of 8 valid cases are represented by the respondents in relation to smoking. The data in this study failed to show a significant reduction in smoking or alcohol consumption due to random subject selection that led to few participants. As noted previously, the number of smokers decreased from 8 to 5, but some were the result of failure of subject to respond on the post-test. Data is incomplete on the subject who reported alcohol consumption on the pre-test, as she failed to keep her scheduled prenatal visit.

Table 19: Attempts at Changing Smoking and Alcohol Consumption

Question	Frequency Pre-test	Valid Percent Pre-test	Frequency Post-test	Valid Percent Post-test
13. Tried everything possible to reduce alcohol consumption.				

_ Strongly Disagree	0.0	0.0	Missing	Missing
_ Somewhat Disagree	0.0	0.0		
_ Somewhat Agree	1.0	100		
_ Strongly Agree	0.0	0.0		
14. Tried Everything possible to reduce smoking.				
_ Strongly Disagree	1.0	12.5	1.0	20
_ Somewhat Disagree	0.0	0.0	0.0	0.0
_ Somewhat Agree	4.0	50	3.0	60
_ Strongly Agree	3.0	37.5	1.0	20
15. Number of Cigarettes per day.				
_ 15 - 24 per day	1.0	12.5	1.0	20
_ 11 – 14 per day	4.0	50.0	2.0	40
_ 10 or less per day	3.0	37.5	2.0	40

Section III in the survey, The Cranley Maternal-Fetal Attachment Scale, was intended to analyze the attachment between mother and fetus before and after the obstetrical ultrasound. Cranley Maternal-Fetal attachment items are ranked from most agreed to item to that which ranked the lowest. Table 20 demonstrates the computed results before the obstetrical ultrasound. Scores

were based on a 1 – 5 scale with a score of 5 having the greatest attachment. Those statements showing the highest mean score included “I’m really looking forward to seeing what the baby looks like” (mean = 4.656) and “I can hardly wait to hold the baby” (mean = 4.426). The least significant statements were “I grasp my baby’s foot through my tummy to move it around” (mean = 1.966) and “I can tell that the baby has hiccups”(mean = 2.383).

Table 20: Cranley Maternal-Fetal Attachment Scale Pre-test

I think or do the following:	n	Mean	S.D.	Order
5. I’m really looking forward to seeing what the baby looks like.	61	4.656	.574	1
18. I can hardly wait to hold the baby.	61	4.426	.741	2
2. I feel all the trouble of being pregnant is worth it.	61	4.377	.637	3
19. I try to picture what the baby will look like.	61	4.377	.734	4
8. I imagine taking care of baby.	61	4.328	.651	5
15. I eat meat & vegetables to be sure my baby gets a good diet.	60	4.317	.504	6
11. I do healthy things that I would not do if I weren’t pregnant.	61	4.049	.956	7
23. I give up doing certain things because I want to help my baby.	61	4.016	1.025	8
4. I picture myself feeding baby.	61	4.000	1.000	9
14. I wonder if the baby thinks and feels “things” inside of me.	60	3.750	1.035	10
3. I enjoy watching my tummy jiggle as the baby kicks inside.	54	3.741	1.013	11
12. I wonder if the baby can hear inside of me.	61	3.738	1.168	12

1. I talk to my unborn baby.	61	3.525	1.149	13
10. I have decided on a name for a baby girl.	60	3.367	1.248	14
6. I wonder if the baby feels cramped in there.	60	3.317	1.186	15
13. I have decided on a name for a baby boy.	61	3.213	1.185	16
17. I poke my baby to get him/her to poke back.	61	2.770	1.116	17
16. It seems my baby kicks and moves to tell me its eating time.	61	2.705	.843	18
20. I stroke my tummy to quiet the baby when there is much kicking.	60	2.700	1.094	19
7. I refer to my baby by nickname.	61	2.672	1.151	20
9. I can almost guess what my baby's personality will be from the way he/she moves around.	61	2.627	.927	21
22. I feel my body is ugly.	61	2.590	1.070	22
21. I can tell that the baby has hiccups.	60	2.383	.825	23
24. I grasp my baby's foot through my tummy to move it around.	59	1.966	.524	24

Table 21 represents the maternal-fetal bonding scores after the obstetrical ultrasound was applied. The table is ordered by maternal-fetal attachment item that had the highest mean to that questions which ranked the lowest. The post-test results produced a slightly different ordering of the items with the statement included "I'm really looking forward to seeing what the baby looks like" (mean = 4.623) continuing to rank number one in significance. The statement "I can hardly wait to hold the baby" decreased from the second most significant question to number 3 in rank order. The least significant statements remained the same in both the pre-test and the post-test. They included the statements

“I grasp my baby’s foot through my tummy to move it around” (mean = 2.356) and “I can tell that the baby has hiccups”(mean = 2.052). Questions where the mean increased significantly included Item #9 – “I can almost guess what my baby’s personality will be from the way she/he moves around.” The mean score on the pre-test was 2.627 (S.D.= .927), while the post-test mean was 2.918 (S.D. = 1.021). This question moved up in rank order from question 21 to question 17. Significant mean score change also resulted in question # 18 – “I can hardly wait to hold the baby.” The mean score increased from 4.426 (S.D. = .741) to 4.517 (S.D. =.748). Question #4 – “I picture myself feeding the baby” increased mean from 4.000 (S.D.=1.000) to a mean score of 4.131 (S.D. = .866). Finally, Question #7 – “I refer to my baby by nickname.” Increased from a mean score of 2.672 (S.D.=1.151) to 2.885 (S.D. = 1.253).

Table 21: Cranley Maternal-Fetal Attachment Scale Post-test

I think or do the following:	n	Mean	S.D.	Order
5. I’m really looking forward to seeing what the baby looks like.	61	4.623	.522	1
2. I feel all the trouble of being pregnant is worth it.	61	4.607	.493	2
18. I can hardly wait to hold the baby.	60	4.517	.748	3
19. I try to picture what the baby will look like.	60	4.383	.804	4
8. I imagine taking care of baby.	61	4.328	.724	5
11. I do healthy things that I would not do if I weren’t pregnant	61	4.213	.859	6

23. I give up doing certain things because I want to help my baby.	61	4.197	.833	7
15. I eat meat & vegetables to be sure my baby gets a good diet.	61	4.197	.572	8
4. I picture myself feeding baby.	61	4.131	.866	9
14. I wonder if the baby thinks and feels “things” inside of me.	61	3.721	1.035	10
3. I enjoy watching my tummy jiggle as the baby kicks inside.	54	3.648	1.067	11
1. I talk to my unborn baby.	61	3.574	1.217	12
12. I wonder if the baby can hear inside of me.	60	3.567	1.170	13
10. I have decided on a name for a baby girl.	60	3.322	1.332	14
6. I wonder if the baby feels cramped in there.	60	3.200	1.132	15
13. I have decided on a name for a baby boy.	60	3.183	1.186	16
9. I can almost guess what my baby’s personality will be from the way he/she moves around.	59	2.918	1.021	17
7. I refer to my baby by nickname	61	2.885	1.253	18
16. It seems my baby kicks and moves to tell me its eating time.	60	2.817	.873	19
17. I poke my baby to get him/her to poke back.	61	2.787	1.171	20
20. I stroke my tummy to quiet the baby when there is much kicking	60	2.750	1.068	21
22. I feel my body is ugly.	61	2.639	1.126	22
21. I can tell that the baby has hiccups.	59	2.356	.866	23
24. I grasp my baby’s foot through my tummy to move it around.	58	2.052	.544	24

Dependent groups *t*-tests on individual items 1 –24 were applied of the Cranley Maternal – Fetal Attachment Scale for the total group of respondents.

Table 22 displays the statistical analysis with significance noted in the statement

“All the trouble of being pregnant is worth it” ($p = .005$) and “I refer to my baby by nickname” ($p = .049$). In both items, mothers scores significantly increased from pre- to post-test test. Trends were noted in “I picture my self feeding the baby ($p = .059$) and in “I wonder if the baby can hear inside of me”($p = .096$).

Table 22: Dependent Groups *t*-test on MFA Scale, Items 1 – 24

Item	Mean(S.D)	t-value	Df	2-tail Prob.
	Pre-test Post-test			
1. I talk to my unborn baby.	3.52(1.14) 3.57(1.22)	-.69	60	.496
2. All the trouble of being pregnant is worth it.	4.37(.637) 4.60(.493)	-2.91	60	.005
3. Enjoy watching tummy jiggle as baby kicks.	3.71(1.01) 3.67(1.00)	.44	51	.659
4. I picture self feeding the baby.	4.00(1.00) 4.13(.866)	-1.93	60	.059
5. Looking forward/see what baby looks like.	4.67(.569) 4.63(.517)	.70	60	.484
6. Wonder if baby feels cramped.	3.32(1.16) 3.25(1.22)	.53	58	.597
7. I refer to baby by nickname.	2.67(1.15)	-2.01	60	.049

	2.83(1.22)			
8. Imagine myself taking care of the baby.	4.32(.651) 4.36(.708)	-.63	60	.532
9. Guess baby's personality by movement.	2.62(.927) 2.94(1.00)	1.40	57	.167
10. Decided on name for a girl baby.	3.36(1.23) 3.27(1.32)	1.40	57	.167
11. Do things-stay healthy because pregnant.	4.09(.926) 4.19(.853)	-1.52	60	.135
12. Wonder if baby can hear inside of me.	3.68(1.18) 3.60(1.18)	1.69	59	.096
13. Decided on name for a boy baby.	3.25(1.20) 3.15(1.04)	1.18	59	.243
14. Wonder if baby thinks/feels inside of me.	3.75(1.03) 3.71(1.04)	.33	59	.742
15. Meat/Veg. so baby gets a good diet.	4.33(.475) 4.23(.56)	1.63	59	.109
16. Baby kicks/moves to tell me eating time.	2.73(.841) 2.80(.860)	-.94	59	.350
17. Poke baby to get him/her to poke back.	2.72(1.08) 2.77(1.14)	-.52	60	.606
18. I can hardly wait to hold the baby.	4.43(.739)	-1.40	59	.167

	4.51(.804)			
19. Try to picture what baby will look like.	4.38(.739) 4.38(1.10)	.00	59	1.000
20. Stroke tummy to quiet baby when kicking.	2.73(1.10) 2.78(1.10)	-.62	59	.536
21. I can tell that the baby has hiccups.	2.40(.812) 2.38(.851)	.30	58	.766
22. I feel my body is ugly.	2.52(1.04) 2.57(1.10)	-.65	60	.517
23. Give up certain things/help my baby.	4.08(.954) 4.24(.789)	-1.60	60	.115
24. Grasp foot through tummy to move it.	1.95(.534) 2.06(.548)	-1.63	59	.109

The Cranley Maternal-Fetal Attachment Scale can be further classified into categories which represent a connection and interaction with a mother and her unborn baby. These five groups of aspects of the relationship between mother and fetus include roletaking, differentiation of self, giving of self, attributing to fetus and interaction with fetus. Table 23 demonstrates the specific questions that relate to the subscale groups.

Table 23: Items from the Subscales of Maternal-Fetal Attachment Scale

Subscale	Item
Roletaking	4. I picture myself feeding the baby.
	8. I imagine myself taking care of the baby.
	18. I can hardly wait to hold the baby.
	19. I try to picture what the baby will look like.
Differentiation of Self from Fetus	3. I enjoy watching my tummy jiggle as the baby kick inside.
	5. I'm looking forward to seeing what the baby looks like.
	10. I have decided on a name for a girl baby.
	13. I have decided on a name for a boy baby.
Interaction with Fetus	1. I talk to my unborn baby.
	7. I refer to my baby by a nickname.
	17. I poke my baby to get him/her to poke back.
	20. I stroke my tummy to quiet the baby when there is too much kicking.
	24. I grasp my baby's foot through my tummy to move it around.
Attributing Characteristics to the Fetus	6. I wonder if the baby feels cramped in there.
	9. I can almost guess what my baby's personality will be

	from the way she/he moves around.
	12. I wonder if the baby can hear inside of me.
	14. I wonder if the baby thinks and feel things inside of me.
	16. It seems my baby kicks and moves to tell me its eating time.
	21. can tell that my baby has the hiccups.
Giving of Self	2. I feel all the trouble of being pregnant is worth it.
	11. I do things to try to stay healthy that I would not do if I were not pregnant.
	15. I eat meat and vegetables to be sure my baby gets a good diet.
	22. I feel my body is ugly.
	23. I give up doing certain things because I want to help my baby.

The mean and standard deviation on the five average subscale scores of the MFA scale (pre-test and post-test) was computed for the total group of respondents, and compared to the standard MFA mean scores. The highest mean scores appeared to be in the subscale of roletaking with both pre-test (mean = 4.283) and post-test (mean = 4.339). The least significant subscale was in the area of interaction with fetus, although that remained significant at 3.11

(pre-test) and 2.734 (post-test). Increases in the mean score were found in the areas of roletaking (from 4.283 to 4.339) and giving of self (from 3.867 to 3.970).

Table 24: Total Subscale Scores of Cranley Maternal-Fetal Attachment

Sub-group	Cranley	Pre-test	Post-test
	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)
Roletaking	4.33 (.645)	4.283 (.665)	4.339 (.672)
Differentiation of Self	4.27 (.548)	3.755 (.672)	3.705 (.672)
Giving of Self	4.09 (.464)	3.867 (.512)	3.970 (.477)
Attributing to Fetus	3.22 (.692)	3.089 (.626)	3.086 (.684)
Interaction with Fetus	3.11 (.809)	2.734 (.630)	2.822 (.695)

Table 25 reveals data through the use of repeated measures *t*-tests on the subscales and the total attachment score. Significant differences were evident in the subscales of interaction with fetus ($p = .036$), giving of self ($p = .021$) and in the total score ($p = .040$). A trend was viewed in the area of roletaking ($p = .069$).

The overall Maternal – Fetal Attachment Scale Pre-test showed a mean score of 3.4772 (S.D. = .440) whereas the mean score Post-test was 3.5228 (S.D. = .466). Maternal – fetal attachment appeared to increase significantly ($p = .04$).

Table 25: Independent *t*-tests on MFA Subscales

Item	Mean(S.D.)	Mean(S.D.)	t-	Df	2-tail
	Pre-test	Post-test	Value		Prob.
Roletaking	4.29(.669)	4.34(.677)	-1.85	60	.069
Differentiation of Self/Fetus	3.76(.662)	3.69(.664)	1.38	58	.174
Interaction with Fetus	2.72(.6.4)	2.80(.667)	-2.14	59	.036
Attributing Characteristics	3.08(.626)	3.10(.690)	-.51	59	.614
Giving of Self	3.88(.494)	3.97(.477)	-2.37	60	.021
Total Score for Fetal Attachment	3.47(.440)	3.52(.466)	-2.10	59	.040

The respondents were further categorized into less than 20 weeks gestation and greater than 20 weeks gestation. There were 32 subjects <20 weeks gestation and 29 subjects >20 weeks gestation. Statistical analysis comparing these two groups showed no significant differences on the subscale scores of the MFA related to gestational age.

Table 26: *t*-tests of Subscales of MFA Scores Related to Gestational Age

Item	Mean(S.D.)	Mean(S.D.)	t- Value	Df	2-tail Prob.
	<20 weeks (n=32)	>20 weeks (n=29)			
Roletaking	4.45(.533)	4.23(.801)	1.27	48	.211
Differentiation of Self/Fetus	3.57(.673)	3.83(.640)	-1.49	57	.142
Interaction with Fetus	2.75(.737)	2.65(.762)	-.62	58	.538
Attributing Characteristics	3.11(.607)	3.09(.880)	.11	58	.912
Giving of Self	3.99(.400)	3.95(.761)	.29	59	.773
Total Score for Fetal Attachment	3.51(.451)	3.52(.489)	.06	58	.951

Table 27 further classifies the Maternal-Fetal Attachment scores into those subjects that felt fetal movement and those that did not. Forty-five subjects reported having felt fetal movement and 16 subjects were uncertain or reported “no” to the question: “Have you felt the baby move?” The dependent *t*-test demonstrated a significant difference in the MFA subscale of “interaction with fetus” with the means of the Group 1 (have felt movement) at 2.84 and the means of Group 2 (have not felt movement) at 2.333. Those who had felt movement were significantly higher the subscale of “interaction with fetus” ($p = .01$). Mothers who had felt movement at the time of the obstetrical ultrasound (n

= 45, M = 3.51, SD = .462) did not have significantly higher attachment scores than those who had not felt fetal movement (n = 16, M = 3.40, SD = .392) on the total score of the MFA scale

Table 27: Independent t-tests MFA Subscales Related to Fetal Movement

Sub-group	Mean (S.D.)		t- value	Df	2-tail Prob.
	Fetal Movement (n=45)	No Fetal Movement (n=16)			
Roletaking	4.2722(.693)	4.3281(.617)	-.28	59	.777
Differentiation of Self	3.7944(.647)	3.6771(.797)	.59	59	.560
Giving of Self	3.8667(.484)	3.9188(.536)	-.36	59	.721
Attributing to Fetus	3.1081(.702)	3.0146(.311)	.72	55	.476
Interaction with Fetus	2.8489(.583)	2.3333(.505)	3.06	58	.01
Total Score for Fetal Attachment	3.5184(.462)	3.4034(.392)	.89	59	.379

Table 28 relates to the Maternal-Fetal Attachment scale pretest form using demographic #10 which relates to the number of times the respondent has been pregnant. Group 1 was experiencing their first pregnancy, whereas group 2 was in their second or more pregnancy. Thirty-two were experiencing their first pregnancy and 29 were in their second or more pregnancy. There was a trend noted in maternal-fetal attachment relating to subscales using gravida ($p = .06$).

The MFA Scale total score Pre-test mean score (when looking at first pregnancies versus succeeding pregnancies) was 3.5901(S.D.=.401) for first pregnancies as compared to 3.3758(S.D.=.470) for succeeding pregnancies. A significant difference was found based on gravida on the subscale of “differentiation of self” ($p = .05$). In this subscale those who were in their first pregnancy scored significantly higher.

Table 28: Scores of Cranley MFA Subscales Related to Gravida

Sub-group	Mean (S.D.)	t- Value	Df	2-tail Prob.
	1 st Pregnancy (n=32) 2 nd Pregnancy or >(n=29)			
Roletaking	4.3594(.635) 4.2069(.707)	.89	59	.378
Differentiation of Self	3.9635(.708) 3.5431(.595)	2.50	59	.05
Giving of Self	3.9500(.482) 3.8034(.505)	1.16 59		.251
Attributing to Fetus	3.1958(.557) 2.9598(.675)	1.49	58	.426
Interaction with Fetus	2.7806(.672) 2.6552(.526)	.80	59	.140
Total Score for Fetal Attachment	3.5901(.401) 3.3758(.470)	1.92	59	.060

Statistical analysis was further applied in relation to maternal age, marital status, education and gross income on the Maternal – Fetal Attachment Subscale scores. The analysis is demonstrated in the following four tables.

Table 29 demonstrates *t*-tests on independent groups based on age. Group 1 consisted of those respondents 29 or younger, whereas Group 2 displayed

those respondents 30 or older. MFA (total scores) showed significance at the .05 level in regards to age. Post-test scores on Group 1 (29 or younger, n = 33) showed a mean score of 3.63 (S.D. .476), while Group 2 (30 or older, n = 27) showed a mean score of 3.39(S.D. .425). One significant difference was found on subscales of the MFA Scale related to age. For the subscale “differentiation of self from fetus,” those who were younger (29 and below) scored significantly higher at the .01 level than those 30 or older. One trend was found “attributing characteristics” subscale. Again those who were 29 or younger scored higher.

Table 29: Independent groups t-tests on MFA Subscales Using Age

Item	Mean(S.D.) 29 or younger (n=34)	Mean(S.D.) 30 or older (n=27)	t-Value	Df	2-tail Prob.
Roletaking	4.47(.538)	4.18(.800)	-1.65	43	.107
Differentiation of Self/Fetus	3.92(.654)	3.40(.561)	3.28	57	.01
Interaction with Fetus	2.84(.773)	2.76(.520)	.47	56	.637
Attributing Characteristics	3.23(.683)	2.93(.673)	1.75	58	.086
Giving of Self	4.00(.485)	3.93(.474)	.54	59	.592
Total Score for Fetal Attachment	3.63(.476)	3.39(.425)	2.06	58	.05

Table 30 demonstrates the independent group *t*-tests on Maternal – Fetal Attachment Subscales related to marital status. Group 1 consisted of 42 married subjects, while Group 2 consisted of the 18 unmarried subjects. Marital status was a significant difference at the .05 level with the subscales of “roletaking” and “differentiation of self from fetus” ($p = .05$). In both findings, those who were not married scored significantly higher. The total fetal attachment post-test score showed Group 1 (married, $n = 42$) with a mean score of 3.44 (S.D. = .461) and Group 2 (unmarried, $n = 18$) with a mean score of 3.70 (S.D. = .435). Again, those who were not married scored significantly higher than those married.

Table 30:Independent Groups *t*-test on MFA Subscales Using Marital Status

Item	Mean(S.D.)	Mean(S.D.)	t- Value	Df	2-tail Prob.
	Married (n=42)	Not Married (n=19)			
Roletaking	4.20(.700)	4.67(.500)	-2.64	59	.05
Differentiation of Self/Fetus	3.57(.635)	3.97(.664)	-2.18	57	.05
Interaction with Fetus	2.74(.678)	2.95(.635)	-1.13	58	.261
Attributing Characteristics	3.01(.657)	3.30(.744)	-1.48	58	.143
Giving of Self	3.97(.464)	3.97(.518)	.02	59	.982
Total Score for Fetal	3.44(.461)	3.70(.435)	-2.08	58	.05

Attachment

Table 31 displays the independent *t*-tests on the Maternal - Fetal Attachment subscale scores of the respondents based on their educational attainment. Twenty-two respondents reported an education of high school or less. Thirty-eight respondents recorded a post-secondary education. No significance was found on the MFA subscales in relation to education.

Table 31: Independent Groups *t*-test on MFA Subscales Using Education

Item	Mean(S.D.)	Mean(S.D.)	t-Value	Df	2-tail Prob.
	H.S. or less (n=22)	Post-Secondary (n=39)			
Roletaking	4.46(.525)	4.27(.748)	1.03	59	.307
Differentiation of Self/Fetus	3.73(.751)	3.67(.617)	.34	57	.735
Interaction with Fetus	2.80(.818)	2.80(.574)	.02	58	.983
Attributing Characteristics	3.19(.766)	3.04(.647)	.83	58	.412
Giving of Self	3.92(.515)	3.99(.460)	-.53	59	.599
Total Score for Fetal Attachment	3.49(.429)	3.49(.429)	.59	58	.554

Table 32 demonstrates the MFA subscales in relation to gross income. Nineteen respondents reported income under \$20,000, while 40 respondents reported \$20,000 or more. Two respondents failed to respond. When dividing the subjects into categories of annual gross income, significance was detected in the MFA subscales of “roletaking” ($p = .05$) and “differentiation of self from fetus” ($p=.05$). In both cases, respondents with income under \$20,000 scored significantly higher than those over \$20,000 or more. No significant difference was found on the total MFA score for fetal attachment based on income.

Table 32: Independent Groups *t*-test on MFA Subscales Using Income

Item	Mean(S.D.)	Mean(S.D.)	t-Value	Df	2-tail Prob.
	Under \$20,000 (n=19)	\$20,000 or More (n=37)			
Roletaking	4.64(.451)	4.21(.723)	2.61	52	.05
Differentiation of Self/Fetus	4.01(.644)	3.59(.624)	2.34	55	.05
Interaction with Fetus	2.92(.606)	2.79(.688)	.68	56	.502
Attributing Characteristics	3.09(.697)	3.11(.712)	-.07	56	.943
Giving of Self	3.93(.499)	4.00(.476)	-.51	57	.615
Total Score for Fetal Attachment	3.64(.406)	3.49(.483)	1.16	56	.252

Reliability

Cronbach's alpha reliability coefficient was applied on the subgroups of the Maternal – Fetal Attachment Scale for the total group of respondents. The results are evident in Table 33. The Cronbach's alpha coefficient of reliability was .85 for Cranley's Maternal – Fetal Attachment Scale, whereas the subscales had coefficient alphas ranging from .52 to .73. Total scores using Cronbach's Alpha Reliability Coefficient on the Maternal-fetal attachment scores were high on both the pre-test (alpha coefficient = .8095 and standardized item alpha = .8230) as well as on post-test (alpha coefficient = .8472 and standardized item alpha = .8701). These coefficients are significantly high for claiming internal consistency and reliability.

Table 33: Cronbach's Alpha Reliability Coefficient on MFA Attachment Scale

Pre-test		
Item	Alpha Coefficient	Standardized Item Alpha
Roletaking	.8650	.8822
Differentiation of Self/Fetus	.4095	.4057
Interaction with Fetus	.5203	.4573
Attributing Characteristics	.7069	.7048
Giving of Self	.5499	.5892
Total Score for Fetal Attachment	.8095	.8230

Post-test		
Item	Alpha Coefficient	Standardized Item Alpha
Roletaking	.8851	.8897
Differentiation of Self/Fetus	.4147	.4544
Interaction with Fetus	.5933	.5994
Attributing Characteristics	.7722	.7685
Giving of Self	.5651	.6573
Total Score for Fetal Attachment	.8472	.8701

Qualitative Data

Qualitative data supported the statistical information poignantly with a visual display of human emotions and verbalization during the ultrasound exam. It was rare for a mother to turn away from the ultrasound monitor – approximately 94% of the time, eyes were on monitor as indicated by Table 34. This table represents observations made on part of the second sonographer as the obstetrical ultrasound was taking place. It is not uncommon to hear the mother’s comment that she wishes she had ultrasound equipment at home, just so she could “check on her baby.” The awe and overall happiness on the mother’s face during the exam mirrored the inner most love of an endearing mother. A powerful bond was indeed strengthened and accelerated in its formation during this interval of observation and conversation, with 66% of the mothers calling their baby by a term of endearment or name. Thirty-three percent of the

mothers cried tears of happiness by the completion of the scan. It was common (30%) for a mother to discipline her child during the scan, telling him/her to cooperate for the ultrasound or to move so the parents could determine the gender. Approximately 66% of the mothers referred to her baby with a name other than “it” by the completion of the scan.

Many mothers expressed the emotional impact as overwhelming in such statements as “...words cannot express what I felt...helped create a bond for me and my husband....I learned so much!” Bonding takes place through a loving interaction or a tender presence, eye contact and sound. This was also witnessed by the table of qualitative data that shows 94% of mothers keep their eyes glued on the monitor screen, so as not to miss a single move of their baby. They only took their eyes off the monitor to look at their husband or another child. The little unknown dimension of parenthood is the bonding that occurs in the ultrasound exam room.

The positive interaction is an expression of interest in relation to the fetus as a special person. This interaction can be expressed in playful words or excitement when seeing the image on the ultrasound monitor. More concrete statements, such as calling the fetus by name, expressing some dream or fear they may have about the fetus, or stating some expectation can display it. See Table 34 for observations.

Table 34: Observation Table

OBSERVATION	% of OCCURRENCE
Time spent with mother’s face intently on ultrasound screen (never off screen for more than 10 –20 secs total)	Approximately 94%
Expression on mother’s face appears content, smiling	100%
Mother refers to her baby with name other than “it” by completion of scan	66%
Mother cries tears of happiness as she watches the monitor	33%
Mother speaks to or disciplines her baby	30%
Mother connects characteristics of other family to the baby	30 %
Mother touches the monitor to get closer to her baby	27%
Mother moves body closer to the monitor	23 %
Mother pokes at her stomach to make the baby move	11 %

Section IV of the survey included a sheet with three questions that the mother answered after the ultrasound. They were asked: 1. What do you remember most about your ultrasound? 2. Describe your feelings during the ultrasound. 3. What did you learn from the ultrasound? Table 35 demonstrates the pattern to the answers to these questions. The number one response to what the subjects remembered most was the baby’s movement (44%), followed by fetal anatomy (21%). When asked to describe their feelings, the response written most frequently, by far, was “excited” (49%). The secondary response or “feeling” of the respondents was “relieved” (18%). When inquiring what the subjects “learned”, a frequent retort was “my baby looks fine – I am reassured” (59%) followed by factual information of weight and/or gender (36%) and “growth and development” of the baby (34%).

Table 35: Maternal Statements and Written Comments

Research Questions	Quotes showing Maternal-Fetal Bonding	Percentage Responding
What do you remember most about your ultrasound?	▪ The baby’s movement	44%
	▪ Fetal anatomy	21%
	▪ Fetal gender	16%
	▪ Baby’s face	11%
	▪ “the miracle of it all”	8%
Describe your feelings during the ultrasound.	▪ “Excited”	49%
	▪ “Relieved”	18%
	▪ “Nervous”	13%
	▪ “I feel I am really pregnant.”	10%
	▪ “Love for my baby”	10%
What did you LEARN from your ultrasound?	▪ “Baby looks fine—reassured”	59%
	▪ “the weight and/or gender of the baby.”	36%
	▪ “growth and development of the baby”	34%
	▪ “baby moves more than I realized.”	11%
	▪ “Due date is accurate”	6%

DISCUSSION

The researcher's primary intent was to understand factors that may enhance and assist in the formation of positive attitudes towards improved maternal behaviors as the result of the obstetrical ultrasound. Additionally, the secondary expectation was to raise the level of consciousness regarding the value of the fetal ultrasound and to stress the gravity and the magnitude of a professional and educated sonographer. Demographic characteristics were investigated to determine their effects on the variables. Information was collected from the use of the Cranley Maternal-Fetal Attachment scale and a researcher-produced health habit questionnaire. Qualitative data added emphasis to the study, being perceived by an independent observer, as well as subjects responding freely to three questions with written responses following the obstetrical ultrasound.

Sixty-one women who were in the second trimester of a normal pregnancy participated in this study. The majority of subjects were married, with an average age of 28. This factor is a function of the average of conception and parenthood in the United States. The subjects were a convenience sample within a Women's Health Clinic that consisted of pregnant women at 18 – 22 weeks gestation with uncomplicated singleton pregnancies.

Ultrasound is quickly becoming a customary technology that many physicians and patients consider a routine part of prenatal care. A second-trimester routine scan is a standard of care in Canada, Australia, Britain, Finland, and Sweden. In France and Germany, at least two scans are common—one in

the second trimester (18-22 weeks) and another in the third trimester (31-35 weeks). Professional associations in the United States do not subscribe to routine obstetrical ultrasounds. The results of this survey supply data that support the consequence of the obstetrical ultrasound in terms of improving maternal-fetal bonding and nutrition.

The Radius Study that concluded that “screening ultrasonography did not improve perinatal outcome as compared with the selective use of ultrasonography on the basis of clinical judgement,” only looked at the detection of anomalies and did not look at the psychological impact the screening had on the mother (Ewigman, Crane, Figoletto, Lefevre, Bain, McNellis, & the Radius group, 1993). There was a significant interaction between mother and fetus during the ultrasound exam that encompassed humanity, compassion and the very beginning of the mother-child bond or attachment process. Any sonographer can feel it when they scan. They can sense the awe. In the present study, qualitative data supports this and the statistical analysis lends moderate support. The sonographer is the privileged member of the surrounding assemblage, be it only mother, fetus and self or an entire group of mother, father, fetus, siblings, grandparents or friends. The change that occurs in the mother during the ultrasound exam can be measured in terms of improvement in prenatal care following the scan. The obstetrical ultrasound substantially increased maternal-fetal bonding to the extent that behaviors associated with nutrition use were positively enhanced. However, minimal data was provided in relation to alcohol consumption, with only one subject responding affirmative to

the question. That particular subject failed to show for her follow-up visit for prenatal care, thus providing lack of post-test results. Both the smoking and alcohol consumption groups provided an inadequate sample size that made it impossible to apply inferential statistics. However, a small behavior change was noted. In relation to smoking, eight respondents reported smoking in the pre-test with five subjects continuing to smoke, as indicated by post-test results. While the above relationships were positive, they do not provide overwhelming evidence.

Nutrition appeared to show moderate improvement between the ultrasound exam and follow-up prenatal visit. Significant differences were found in question #1 (Do you start your day with a well-balanced meal?). Two other areas showed significant differences. Those included an increase in the number of fruits and vegetables and an increase in milk products. Significance was apparent in nutrition when the groups were divided by age, marital status and income. Using age, a trend was noted in the number of servings of fruits/vegetables and in the amount of meat/fish/alternatives with married mothers having the largest intake. Marital status showed significant differences in the areas of servings of fruits/vegetables, cereals/breads and amount of meat/fish/alternatives. Applying income, consequence is apparent in the servings of fruits/vegetables, cereals/breads and amount of fish/meat/alternatives with those having an income of \$20,000 or more having a significantly increased intake.

An early affectionate bond was created that provides a reassuring image of their baby, promoting mother's health behaviors. Attachment appears to be improved even after quickening which Lumley (1990) reported to the contrary. Fletcher and Evans (1983) reported an intensified "bond of loyalty" between expectant mothers and their fetuses. Information and observation about maternal behavior helped us understand the human aspects of the mother-infant relationship as well as human relationships in general. A bond of loyalty is readily appreciated in the observation of the mother as she peers out into the dimly lit room observing every movement of her fetus. Her eyes are on the screen the majority of the time! Tears illustrate the love and the "bond of loyalty" that Fletcher reports in his publication.

Heidrich and Cranley devote many publications to the relationship of mother and fetus/infant. The most significant data pertinent to this study entails: "Ultrasound did not demonstrate a significant effect..." (1989). They felt that the obstetrical ultrasound did not accelerate or contribute to maternal-fetal attachment. Qualitative data gathered in my study presents itself poignantly at times with phases such as "words cannot express how I feel", tears of joy flowing uncontrollably, and the inability of the mother to turn her face away from the ultrasound monitor. Quantitative data suggests a moderate effect with the total attachment showing significance. Furthermore, this attachment did appear to show an improvement in the nutritional habits of the mother.

"No significant correlations were found between the attachment scores and educational level, age, race, whether the pregnancy was planned, whether the women had a sonogram or the ordinal position of the infant" by Kemp (1987). Demographic data within this study was divided into subcategories to explore further any possible correlations. Health habits in regard to smoking and alcohol

consumption were not categorized by age, education, income, or marital status due to the limited information from a population that consisted of a majority of non-smokers. Additionally, it was rare to find a mother who drank alcohol during her pregnancy.

The Health Habit Questionnaire showed a small significance in relation to nutritional status when the subjects were divided by age. Group 1 (29 and younger) appeared to eat fewer servings of fruits and vegetables, as well as fewer servings of meat and fish or alternatives than Group 2 (30 or older.) This could be an outcome of income, as the older group tended to be the group with the higher earnings.

The Health Habit Questionnaire showed significant results in relation to annual gross income but not in relation to education. Does this mean that mothers know what they are suppose to eat, but cannot afford it? Mean scores were considerably higher on the questions relating to percentage of nutrition, number of servings of milk, number of servings of fruits and vegetables, number of servings of cereals and breads and the amount of fish/meat/alternatives for those with a higher income. This bears significance for lower socioeconomic groups and their need for subsidized methods of support for the best beginning possible for their child. This provides useful and timely data that could produce trends in the prevalence of prenatal risk factors (poor prenatal nutrition) which are major predictors of infant mortality and low birth weight. Programs are necessary to promote maternal and fetal health to low-income pregnant women. It is well known that the birth weight of a child is highly associated with the overall

health of the baby. In the long run, underweight babies are less healthy and place more demands upon the health care system. Government policy should spend more money on preventive health care (and save money in the long run) in relation to high-risk mothers. The obstetrical ultrasound should be included in preventive health care, as the results of this study purport.

These results do not support developmental theory that a mother's bonding process with her baby is based primarily on the accomplishment of a developmental task, but is rather an effect of a demographic characteristic. These variables may influence intimate feelings of the pregnant woman toward her fetus during the months of pregnancy. The observance of the ultrasound may have an effect on maternal – fetal bonding in the early months, but may decrease as the pregnancy progresses.

Lumley (1990) reported "Short-term effects on maternal health behaviors' including less smoking, less drinking of alcohol and more visits to the dentists were detected in a randomized trial when detailed information was given during the scan." The data in this study failed to show a significant reduction in smoking or alcohol consumption due to random subject selection that led to few participants. Overall, there was a decrease in the number of smokers from 8 to 5, some of which were the result of failure of one subject to respond on the post-test. Collecting data on these subjects is a difficult task as patient compliance is lacking. The same group that smokes and consumes alcohol tend to be the group that do not keep their prenatal visits, which led to the lack of obtaining information on the post-test. When viewing the eight questionnaires individually,

it was noted that two of the smokers that were smoking on the pre-test, had “recently quit.” All of the other smokers were continuing to smoke with the same number of cigarettes smoked per day.

A recent news release by Scripps Howard News Service (1998) states the problem of smoking and pregnancy is even greater than the average public realizes. One in four American women continue to smoke throughout the pregnancy. Continuing cigarette smoking during pregnancy may cause as many as 100,000 fetal deaths yearly. The “cigarette babies” who survive fall into the category of those infants facing higher sudden infant death syndrome, learning disabilities, hyperactivity and behavioral problems. The author recommends a new public education campaign warning pregnant women about the dangers of smoking. Lifestyle behaviors such as cigarette smoking, weight gain during pregnancy, and use of other drugs play an important role in determining fetal growth. Cigarette smoking is the largest known risk factor for low birth weight. More studies need to examine the obstetrical ultrasound and its impact of maternal smoking. Education can provide a vital role.

Lumley further stated: “As used in everyday practice, ultrasound scans are not always accompanied by feedback and when feedback occurs it is sometimes in the form of “slips of the tongue” incorrect diagnoses identification of structures that cannot be deciphered and language that is unfamiliar and alarming to mothers.” This diagnostic toxicity of ultrasound scans of the fetus has not been studied and remains an area of intrigue for further study. The author believes this statement emphasizes the NEED for professional standards in the field of

ultrasound with the expertise in this health field among both physicians and sonographers extremely varied. It is well known that there are many inadequately prepared to perform this procedure thus contributing to “diagnostic toxicity”. With the intense competition for the declining health care dollar, the challenge to maintain quality remains with the individual sonographer, while the need to guarantee a quality obstetrical scan for the consumer is that individual parent’s responsibility. Health care consumers need to know WHO is doing their exam and what their qualifications are.

Qualitative Data

Qualitative data entrusted a realism to the quantitative statistical analysis. Elements of both quantitative and qualitative designs were used together in a mixed-method study to provide more information than could be obtained by using either one alone. The qualitative discovery provided a description and an understanding of the process of the obstetrical ultrasound.

In regards to the question: “What do you remember most about your ultrasound, the primary consensus of concern appeared to be fetal movement. The movement authenticated the physical existence of another human being, separate from the mother. Many mothers expressed the reality of being “really pregnant” when viewing the ultrasound. One mother poignantly wrote: “What I remember most is the realization that there is really a baby in there! I am AMAZED by the technology!” Following movement, mothers appeared to

remember gender, followed by fetal anatomy (often referred to as “the parts of the baby” by the mother in the questionnaire).

When describing maternal feelings during the ultrasound, mothers responded most heartfelt. One mother simply wrote the word “AWESOME!” Another mother summarized it simply: “ EXCITED! I am relieved that the baby is “all there.” I am happy that my husband could be there to share in seeing the baby and being a part of the pregnancy. This baby is very real. This theme was displayed in the majority of responses as demonstrated in the explanation of a mother who wrote: “I am overwhelmed with love, joy and excitement...it is absolutely wonderful!” Comments like: “I can’t believe this baby is inside of me!” and “ I hope our baby is all OK” are commonplace. Another mothers sentiment flowed with sensitivity and passion: “Fear! Concern! Joy! Relief! I saw him moving; I saw his hands, feet, arms legs. Hope!” Mothers reported a peacefulness and a feeling of being “more connected to the baby” but yet account the feeling “that it really is a separate being.”

Mothers overall appreciated the learning experience of the obstetrical ultrasound. Admittedly, some mothers are quiet and ask few questions, but the majority were extremely interested and had an innumerable amount of questions that required an educated response. Learning, understanding, and developing a sense of what is occurring in their bodies leads to both an acceptance and desire to provide their baby with the best of beginnings.

Sonographic observation validated the existence of the sensitivity and emotional impact of the obstetrical ultrasound exam. One only needed to view

the mother's face to come to the realization that a miracle was unfolding as the mother viewed her fetus for the very first time. Her face showed concentration, reflection, amazement, joy, serenity and a contentment that comes only with motherhood and the reality of it all. One mother asserted the feeling by articulating: "It's a miracle", as tears filled her eyes. In this particular study, we found that 33% of the mothers shed tears of happiness as they viewed the ultrasound monitor. Another mother exclaimed: "You can't get much higher than this!" Many mothers talked of the anticipation of waiting for their ultrasound appointment. A common theme after the ultrasound was to talk of the shopping trip after they found out the gender of their baby during the ultrasound.

It was heart-warming to listen to mother's interact with their fetuses and compare them to other members of their family. "He will be a fisherman like his father." "She likes her picture taken, just like her mother!" "Oh! He has big feet, just like his father!" "C'mon, Andrew Michael, let's see what you are." "Hi, baby, I love you." Some mothers waved to their baby. Others clapped their hands with excitement while observing the ultrasound unfold. With the baby initially known as "it", the sonographer heard a countless collection of names unravel throughout his/her day: "honey", "the baby", "junior", "munchkin", "peanut", "T.J.", "Emma" and many more specific names.

Unfortunately, our study included mostly Caucasians (See Table 3), who readily accepted the process of research and answering survey questions. However, we did have a Hmong couple who submitted to the survey more out of politeness than anything else. They sat in the waiting room, speaking in their

native language, answering the survey. They laughed in delight filling out the Cranley Maternal-Fetal Attachment Scale. It was almost as if the survey gave them our permission to form an emotional tie with their baby. Their responses were genuine and open as they smiled and reflected during the ultrasound exam. Their puzzled look while viewing the images, their questioning of the baby's gender, the genuine contentment and love on the mother's face was readily apparent. The reservation they possessed initially, quickly disappeared as they viewed their baby. They captured and expressed the delight of that we saw in the entire population of participants as the items they thought as strange were now validated by the presence of their baby on the ultrasound monitor.

This chapter has examined the data analysis of the survey followed by a discussion that related the generalizations to current use by professionals. Chapter V will contain a summary of the information and draw conclusions from that data. Lastly, it will include recommendations for further educational and professional research.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The final chapter summarizes the methodology and findings of this study of maternal-fetal bonding in relation to health habits following the obstetrical ultrasound. It will continue with conclusions that have been abstracted as a result of the data analysis, leading into the research recommendations for future study. Finally, this chapter will outline the clinical and educational implications of the research inquiry.

Summary

The purpose of this study was to assess the maternal change in behavior and health habits following the obstetrical ultrasound exam. This process involved both a quantitative and qualitative component. Quantitatively, the respondents answered written surveys involving questions in relation to health habits and maternal-fetal interaction. Statistical analysis involving the Student t test was applied and results were computed and examined for significance. Qualitatively, another sonographer during the process of the obstetrical ultrasound exam observed the subjects.

The hypothesis that “ There is no statistically significant correlation between the educational process surrounding the visualization of one’s unborn baby during an obstetrical ultrasound examination and maternal-fetal bonding as is evidenced by scores in the Cranley Maternal-Fetal Attachment Scale” has been disproved to some extent. While the above relationships were positive, they do not provide overwhelming evidence. Additionally the hypothesis that “No

statistically significant changes in maternal nutrition, smoking or alcohol use will correlate with the obstetrical ultrasound as is measured by a researcher-designed questionnaire given before and after the ultrasound,” has, in a sense, been unjustified by this study. It is, however, only supported in a very narrow way, and it is thus impossible to extrapolate these findings, as one might have wished.

Methods and Procedures

The research was accomplished in July/August of 1999 in the Midwestern United States, using a convenience sample from Women’s Health Clinic. The sample involved 61 subjects receiving an obstetrical ultrasound during the 18 – 22 week gestation of pregnancy. All pregnancies were normal and uncomplicated. Prior to the ultrasound procedure, all patients were requested to answer the health habit questionnaire and the Maternal-Fetal Attachment Scale. Data was collected for the maternal-fetal bonding issue as well as responses regarding nutrition, alcohol and smoking. Following the obstetrical ultrasound, the mothers were asked to reply to the Cranley Maternal-Fetal Attachment scale again. A post-test (a repeat of the health habit questionnaire) was administered in a four-week interval to see if the ultrasound has made a statistical difference in the mother’s dietary habits, alcohol or nicotine consumption. The results were analyzed and compared to see if any statistical significance existed by repeated measures Student *t*-test with $p < 0.05$ being considered significant. The repeated measures design, often referred to as within-subjects designs, offered more opportunity to study the research effects while “controlling” the subjects.

Data Analysis

Following collection of the demographics, health habit questionnaire, and Cranley Maternal-Fetal Attachment Scale, the responses were analyzed by the University of Wisconsin – Stout Computer user support service. Frequency and percentage of items were calculated on the demographic information, as well as the mean age and level of education. Frequency and means of the health habit questionnaire was computed and tabulated. The Cranley Maternal-Fetal Attachment Scale was subdivided into groups with a means calculated for each division. Statistical analysis by repeated measure Student *t*- test was accomplished on the Maternal-Fetal Attachment Scale, both on the independent questions and the sub-groups. The repeated measures *t*-test was applied to the health habit questionnaire. To further look at this compilation of data, the computation by *t*-test was completed on age of the mother, educational level of mother, marital status and gross income on post-test results of maternal-fetal attachments in both subscales, total and individual items and post-test results of questionnaires. Individual question item # 8 (have you felt the baby move?) was further studied by *t*-test, as was question # 10 (number of times pregnant). Both were studied by individual items, subscales and total test.

The qualitative or observational component into this study looked at such physical reactions as facial expression, movement, ideas, verbal reactions and their relationship to maternal feelings. A second sonographer was in the ultrasound exam room at the time of the ultrasound to record such data as percentage of time mother's eyes are on screen watching baby, expression on

mother's face, mother's movement toward screen, does the mother cry, mother's speaking or disciplining fetus, does mother poke at her stomach to make her baby move, and if mother compares fetus to someone in her family.

Additionally, the mother was given a sheet to answer three specific questions in her own words. This form included the following questions: Describe your feelings during the ultrasound. What do you remember most about your ultrasound? What did you learn from the ultrasound?

Conclusions

This paper stresses the importance of maternal – fetal attachment and its relation to nutrition. Definite conclusions need to be summarized. They will be discussed according to the initial hypothesis that related maternal – fetal bonding from the obstetrical ultrasound to three individual health behaviors – smoking, alcohol consumption and nutrition. Conclusions will be drawn from the statistical analysis.

Analyzing maternal-fetal bonding and the obstetrical ultrasound, evidence from this study supports the theory that these two variables are directly related. Looking at the mean scores of all of the subscales of the MFA Scale, the results show an increase in all but one group – attributing to fetus. The questions in the “attributing to fetus” category appear to be related to later gestational ages. Roletaking, differentiation of self from fetus, giving of self, and interaction with fetus all increased their mean scores, indicative of behaviors that represent an connection and interaction between mother and fetus. Mothers demonstrated a

higher level of attachment to their fetus following the obstetrical ultrasound. Variables were further categorized in relation to gravida, maternal age, marital status, education, and income. In relation to the number of pregnancies, a trend is demonstrated, that shows increased attachment in first pregnancies. Maternal-fetal attachments scores showed significance at the .05 level in regards to age, with younger mothers showing higher attachment, particularly with the subscales of “differentiation of self from fetus” and “attributing characteristics.” Married mothers showed definite significance in maternal-fetal attachment as compared to single moms. Education did not appear to be significant to bonding, while income did have an impact in the areas of roletaking and differentiation of self from fetus. Additionally, observational evidence is in definite support of maternal-fetal bonding. Clinical impressions provided positive indicators of bonding during the obstetrical ultrasound, such as facial expressions, tone of voice, tears of joy, and individual statements.

Maternal-fetal attachment has been shown to alter maternal life-style and behaviors thus proving beneficial to the fetus. Quantitative data in relation to nutrition showed a convincing and significant correlation with ultrasound and overall maternal behavior changes. Nutritional status, overall, showed an increase in the number of fruits and vegetables, an increase in milk products consumed, as well as an increase in the number of mothers starting the day with breakfast.

The Health Habit Questionnaire showed a significant difference in relation to nutritional status when the subjects were divided by age with the younger

group (<29 years old) appearing to eat fewer servings of fruits and vegetables, as well as fewer servings of meat and fish or alternatives than Group 2 (30 or older.) Improved nutritional habits were noted in those mothers that were married as well as those of a higher socioeconomic status. The Health Habit Questionnaire showed significant results in relation to annual gross income. Mean scores were considerably higher on the questions relating to percentage of nutrition, number of servings of milk, number of servings of fruits and vegetables, number of servings of cereals and breads and the amount of fish/meat/alternatives. The level of education of the respondent appeared to only have limited significance in the nutritional status.

Recommendations for Future Research

This project serves as a preliminary study, which lays the foundation for future endeavors in this area of intrigue. An obvious recommendation for future research displayed itself vividly throughout the study – that is paternal-fetal bonding. The obstetrical ultrasound rendered a tangibility to the pregnancy for the fathers. Fathers appeared to grasp a peek into the world of a pregnant women, while gaining the knowledge of the existence of another human being. Perhaps, this could serve as further justification to insurance companies as to the benefits of ultrasound. Could the obstetrical ultrasound be a contributing factor into the well-being of the family unit?

Even to the results gained by statistical analysis, there exists a multiple number of compounding variables that could have contributed to the change that

occurred. Further recommendations for future research exist that include isolating the ultrasound and its effects by some means, studying different socioeconomic groups, and gathering data on a control group, which would take a very long period of time. Additional data with more constructs should be added to the areas of alcohol and smoking. Another study could be developed where we compare the population of this study to the general population of the U.S. or perhaps the state of Wisconsin (area of study). Generalizing our study could serve as a validity check where one could decide if we need to take caution with our results or if this is indeed a sample of the widespread population. To a more extensive, long-term study, one could look at the effects of prenatal attachment in relating to possibly predicting the postnatal attachment outcome.

Clinical and Educational Implications

From an educational standpoint, the emotional connotations appeal to the significance of ethical standards of medical professionals. The sonographer or health care professional is presenting material that renders a strong sense of character as well as necessitating a thorough understanding of the academics involved. The insightful sonographer should have a firm understanding of human psychology as well as anatomy and physiology. This technology recognizes that it is just that – technology. We, as individuals are ultimately responsible for the experience and its educational implications.

Quantitative data speaks for itself with a statistical difference, especially when the subjects are divided into categories based on age, marital status,

education and annual gross income. Although a certain degree of probability exists, the potential effect of the ultrasound appears to be statistically accounted for. The author realizes that multiple variables exist during a pregnancy to add to improved maternal behavior and bonding. The need for a control group does exist.

Perhaps, even this limited effect can improve neonatal outcome. Women who smoke during pregnancy have smaller babies on an average than non-smokers. It is also known that these women have more premature births, more miscarriages, more still births and more deaths after birth. Decreasing smoking or better yet, quitting altogether will alleviate this statistical problem. These women will never have a better reason to quit.

Low birth weight could be avoided if women did not smoke during pregnancy. Reducing heavy use of alcohol and other drugs during pregnancy could also reduce the rate of low birth weight births. The advocacy before or during pregnancy of more healthful lifestyle behaviors, such as ceasing to smoke, eating an adequate diet and gaining enough weight during pregnancy can positively affect the long-term health of women and the health of their infants. Maternal-fetal attachment through the use of the obstetrical ultrasound can make a difference.

The study raises the ultrasound community's consciousness to the importance of the psychological effects of the obstetrical ultrasound. It has little impact on the great giant – the Radius Study, but it furnishes a note on the implications, worth whatever it may be. If the obstetrical scan assists the mother

to make positive choices in health behavior, then we have succeeded. Maternal and neonatal outcome will improve consequently. The author believes the most important potential benefit of the obstetrical scan is in the reduction of perinatal mortality and morbidity.

Reflecting over the months of this research experience, I feel the length and the intensity of the experience combined with the reverence for the impact the sonographer has on the mother and hence the fetus. I believe that sonographers should be aware of the significance their interaction has on their two patients – mother and fetus. Keeping them as our goal, should provide the energy and the drive to help focus on the importance of knowing our job well as they rely on us to provide them with the best information possible. High quality standards for sonographer education and professional status are of utmost importance. A sonographer needs to be competent life-long learner, a good communicator, and a compassionate, caring human being.

Ultimately, healthy maternal-fetal bonding or attachment is essential to human development and nurturing. The vital link is begun in utero, as the mother watches the visual display of her baby on the ultrasound monitor. The realization that a “real” human being is growing within her stirs an emotional attachment for the mother in the form of a bond that ties. This, along with the verbalization, in turn creates positive interaction resulting in improved dietary habits and lifestyle changes that could have significant impact on the development of the growing fetus. The very early period of “contact” increases maternal-child bonding which in turn assists the development of the child. Perhaps the resounding question of

whether or not the pregnant woman should under go routine prenatal ultrasound needs to include psychological implications as well as looking at the rate of anomaly pick-up. Helen Keller says it best with: “The best and most beautiful things in the world cannot be seen, nor touched... but are felt in the heart.”

Bibliography

Altfeld S., Handler, A., Burton, D., & Berman, L. (1997). Wantedness of pregnancy and prenatal health behaviors. Women Health, 26, 29-43.

American Heritage Dictionary, (2nd edition). (1985) Boston, MA, Houghton Mifflin Company.

Basler, H. (1995). Patient education with reference to the process of behavioral change. Patient Education Counseling, 26(1 – 3) 93 – 98.

Berman, M. & Cohen. H. (1997) Obstetrics and gynecology. (2nd edition). Philadelphia, PA, Lippincott Publishers.

Bralow, L. (1983). Maternal bonding in early fetal ultrasound examinations. New England Journal of Medicine, 114. Letter.

Brown, J., & Kahn, E. (1997). Maternal nutrition and the outcome of pregnancy. Clinical Perinatology, 24, 433-449.

Craig, M. (1995). The ripple effect: final chapter on fetal imaging services. Journal of Diagnostic Medical Sonography, 11, 210 – 212.

Craig, M. (1996). Contradictory images: A Cultural anthropologist views obstetrical ultrasound. Journal of Diagnostic Medical Sonography, 12, 185 – 189.

Cranley, M.S. (1981). Development of a tool for the measurement of maternal attachment during pregnancy. Nursing Research, 30, 281-284.

Eurenius, K., Axelsson, O. & Sjoden, P. (1996). Pregnancy, ultrasound screening and smoking attitudes. Gynecologic and Obstetrical Investigations, 86(3), 347 – 35.

Ewigman, B., Crane, J., Frigoletto, M., LeFevre, M., Bain, R., McNellis, D., the RADIUS Group (1993) Effect of prenatal ultrasound screening on perinatal outcome (RADIUS Study). New England Journal of Medicine, 829, 821 – 827.

Favaretto, E. & Torresani, S. (1997). Parental bonding as a predictive factor for the development of adult psychiatric disorders. Epidemiology Psychiatry Sociology 6, 124 – 138.

Fletcher, J.C, & Evans, M.I. (1983). Maternal bonding in early fetal ultrasound examination. New England Journal of Medicine, 308, 392-393.

Heidrich, S.M., & Cranley, M.S. (1989). Effect of fetal movement, ultrasound scans, and amniocentesis on maternal-fetal attachment. Nursing Research, 38, 81- 84.

Jauniaux, M. (1997). Fetal testing in the first trimester of pregnancy, The Female Patient, 11, 10.

Klaus, M.R., & Kennell, J.H. (1976). Maternal-infant bonding. St. Louis: C.V.Mosby. 38 – 39.

Kohn, C.L., Nelson, A., & Weiner, S. (1980). Gravida's responses to realtime ultrasound fetal image. Journal of Obstetric, Gynecologic, and Neonatal Nursing, 9, 77-80.

Kumar, R. (1997). Anybody's child: Severe disorders of mother-to-infant bonding. British Journal of Psychiatry, 171, 175 – 181.

Lambers, D. & Clark, K. (1996). The maternal and fetal physiologic effects of nicotine, Seminars in Perinatology, 20(2), 115 – 126.

Levi, S. (1998). Is antenatal screening for congenital defects feasible in average-risk populations? The Eurofetus study. Prenatal Neonatal Medicine, 3, 191 – 193.

Lumley, J. (1990). Through a glass darkly: Ultrasound and prenatal bonding. Birth, 17, 214 – 217.

Mann, D. (1997, June 30) All pregnant women benefit from ultrasound exams. Medical Tribune News Service.

Milne, L. & Rich, O. (1981). Cognitive and affective aspects of the responses of pregnant women to sonography. Maternal Child Nursing Journal, 10, 15-39.

Muller, M. (1996). Prenatal and postnatal attachment: A modest correlation. Journal of Obstetric, Gynecologic, and Neonatal Nursing, 161-166.

Nordentoft, M., Lou, H., Hansen, D., Nim, J., Pryds, O., Rubin, P., & Hemmingsen, R. (1997). The effect of smoking and psychosocial factors. Ugeskrift For Laeger (Copenhagen, Denmark) 159, 3393 – 4000.

Paul, K. & Nawrocki, C. (1997). Prenatal ultrasound videos entertainment or excess? Journal of Diagnostic Medical Sonography, 13, 309 – 312.

Reading, A. & Cox, D. (1982). The effects of ultrasound examination on maternal anxiety levels. Journal of Behavioral Medicine, 5, 237 – 245.

Reading, A., Cox, D., Sledmere, C., & Campbell, S. (1984). Psychological changes over the course of pregnancy: a study of attitudes toward the fetus, Health Psychology, 3, 211 – 221.

Ruiz, M., Murphy, B.(1992) Sonographer – fetus bonding. Journal of Diagnostic Medical Sonography, 8, 269 – 275.

Saint-Exupery, Antoine de, (1943) The little prince, Harcourt Brace and Co., New York.

Scripps Howard News Service, (1998, June 4). Pregnant smoking more risky, Eau Claire Leader Telegram, p. 9A.

Secker-Walker, R., Vacek, P., Flynn, B., Mead, F. (1997). Smoking in pregnancy, exhaled carbon monoxide, and birth weight. Obstetrics and Gynecology, 89, 648 – 653.

Seeds, J. (1996).The routine or screening obstetrical ultrasound examination. Clinical Obstetrics and Gynecology, 39(4), 14 – 30.

Shu, X., Hatch, M., Mills, J., Clemens, J., & Susser, M. (1995). Maternal smoking, alcohol drinking, caffeine consumption, and fetal growth: Results from a perspective study. Epidemiology, 6(2), 115 – 120.

Stephens, C. (1985). Perception of pregnancy and social support as predictors of alcohol consumption during pregnancy. Alcoholism: Clinical and Experimental Research, 9, 344-348.

Taylor, J. (1992). The public fetus and the family car: From abortion politics to a Volvo advertisement. Public Culture, 4, 67 – 80.

U.S. Department of Agriculture – U.S. Department of Health and Human Services. (1990) Home and Garden Bulletin No. 232. Washington, DC: Government Printing Office.

Verny, T. & Kelly, J. (1981) The secret life of the unborn child, Dell Publishing, New York.

Weigel, N., Narvaez, W., Lopez, A., Felix, C., & Lopez, P. (1991). Prenatal diet, nutrient intake and pregnancy outcome in urban Ecuadorian primiparas. Archivos Latinoamericanos De Nutricion, 41, 21 – 37.

Zlotogorski Z., Tadmor, O., Rabinovitz, R., & Diamant, Y. (1997). Parental attitudes toward obstetric ultrasound examination. Journal of Obstetrics and Gynecology Research, 23, 25 – 28.

Appendix

Appendix A

Consent Form

I understand that by returning this questionnaire, I am giving my informed consent as a participating volunteer in this study. I understand the basic nature of the study and agree that any potential risks are exceedingly small. I also understand the potential benefits that might be realized from the successful completion of this study. I am aware that the information is being sought in a specific manner so that no identifiers are needed and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

NOTE: Questions or concerns about participation in the research or subsequent complaints should be addressed first to the researcher or research advisor and second to Ted Knous, Chair, UW-Stout Institutional Review Board for Protection of Human Subjects in Research 11 HH, UW-Stout, Menomonie, WI 54751, phone (715) 232-1126.

Appendix B

Obstetrical Ultrasound Intake Form

1. Age of mother: _____

2. Marital Status:

___ Married

___ Single

___ Divorced

___ Other _____

3. What is your family's ethnicity?

___ African-American

___ Asian

___ Caucasian

___ Hispanic

___ Native American

___ Other _____

4. What is the highest level of education completed by the mother?

___ Elementary

___ High School

___ Technical College

___ Some college

___ Bachelor degree

___ Graduate degree

5. What is your annual gross income?

___ Less than \$20,000

___ \$20,000 - \$59,999

___ \$60,000 - \$100,000

___ \$100,000 +

6. Was this a planned pregnancy?

___ Yes ___ No

7. Have you experienced any miscarriages:

___ Yes ___ No

8. Have you had a child with a birth defect or genetic problem?

Yes, if yes, please describe

No

9. Have you felt this baby move?

___ Yes ___ No

10. Number of times you have been pregnant: _____

Appendix C

HEALTH HABIT QUESTIONNAIRE

1. I start my day with a well-balanced meal within 1 to 2 hours of waking.
 rarely or never
 2 – 3 times per week
 4 – 5 times per week
 almost always
2. I feel I eat a variety of foods from all the basic food groups each day?
 Yes No
3. I take a Prenatal vitamin or some nutritional supplement?
 Yes No
4. What percentage of daily nutrition needed for good health for you and for your baby, do you perceive you get?
 0 –25 %
 26 –50%
 50 –75%
 75 – 100%
5. How would you rate your nutritional intake during the past month (as compared to normal)?
 Worse than usual
 No change
 Better than usual
 Exceptional
6. How many servings of milk or milk products do I consume daily?
 1 serving
 2 servings
 3 servings
 4 servings
7. I eat ___ servings of fruits and vegetables every day.
 1 – 2 servings
 3 – 4 servings
 5 – 6 servings
 7 or more servings
8. How many servings of cereals, breads, and whole grain products do I have on an average day?

- 0 –1 serving
- 2 – 3 servings
- 4 – 5 servings
- 6 or more servings

9. On the average, what amount of meat, fish or alternatives do I eat daily?

- little or no meat, fish or alternatives (0 – 2 oz.)
- 3 – 4 oz.
- 5 – 8 oz.
- 9 oz. or more

10. Do you drink alcohol? (beer, wine or hard liquor)

- Yes
- No, but I recently quit. Skip to # 13.
- No, skip to # 13.

11. Each week, I consume the following number of drinks containing alcohol. (1.5 oz. of hard liquor, 12 oz. of beer and 4 oz. of wine are each considered 1 drink)

- 6 or more servings
- 4 – 5 servings
- 1 – 3 servings

12. I have tried everything possible to reduce the amount of alcohol I drink.

- Strongly disagree
- Somewhat disagree
- Somewhat agree
- Strongly agree

13. Do you smoke?

- Yes
- No (skip to next page)

14. I have tried everything possible to stop or reduce the amount I smoke.

- Strongly disagree
- Somewhat disagree
- Somewhat agree
- Strongly agree

15. How many cigarettes do/did I smoke per day on the average?

- more than a pack per day
- 15 – 24 per day (around a pack)
- 11 – 14 per day
- Less than 10 per day

Appendix D

What do you remember most about your ultrasound?

Describe your FEELINGS during the ultrasound.

What did you LEARN from the obstetrical ultrasound ?

A SINCERE THANKS FOR ALL YOUR HELP! 😊

Appendix E

Sonographer Analysis

Fetus referred to as: _____

Comments:

1. Length of scan _____minutes
Length of time mother's eyes are on screen: _____minutes
2. Expression on mother's face: _____
3. Mother refers to her baby with name other than "it" by completion of scan: Yes___ No___
4. Mother moves body closer to the monitor ___ Yes ___No
5. Mother connects characteristics of other family to the baby
___ Yes ___No
Characteristic:

6. Mother speaks to or disciplines her baby:

7. Mother cries tears of happiness as she watches the monitor:
___ Yes ___ No
8. Mother touches the monitor to get closer to her baby
___Yes ___ No
9. Does the mother stroke her abdomen? ___Yes ___ No

Appendix F

Maternal-Fetal Attachment Scale

Please respond to the following items about yourself and the baby you are expecting. There are no right or wrong answers. Your first impression is usually the best reflection of your feelings.

Make sure you mark only one answer per sentence.

<i>I think of do the following:</i>	Definitely Yes	Yes	Uncertain	No	Definitely No
1. I talk to my unborn baby.					
2. I feel all the trouble of being pregnant is worth it.					
3. I enjoy watching my tummy jiggle as the baby kicks inside.					
4. I picture myself feeding the baby.					
5. I'm really looking forward to seeing what the baby looks like.					
6. I wonder if the baby feels cramped in there.					
7. I refer to my baby by a nickname.					
8. I imagine myself taking care of the baby.					
9. I can almost guess what my baby's personality will Be from the way he/she moves around.					
10. I have decided on a name for a girl baby.					
11. I do things to try to stay healthy that I would not do if I were not pregnant.					
12. I wonder if the baby can hear inside of me.					
13. I have decided on a name for a boy baby.					
14. I wonder if the baby thinks and feels "things" inside of me.					
15. I eat meat & vegetables to be sure my baby gets a good diet.					
16. It seems my baby kicks and moves to tell me it's eating time.					
17. I poke my baby to get him/her to poke back.					
18. I can hardly wait to hold the baby.					
19. I try to picture what the baby will look like.					
20. I stroke my tummy to quiet the baby when there is too much kicking.					
21. I can tell that the baby has hiccups.					
22. I feel my body is ugly.					
23. I give up doing certain things because I want to help my baby.					
24. I grasp my baby's foot through my tummy to move it around.					

