

Correlates of antenatal bonding: an Egyptian Study

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Background

The relationship between mother and child develops and progresses throughout the pregnancy period. In recent times there has been increasing interest in antenatal maternal–foetal bonding and its relationship with different variables, as well as the impact of this bonding on the child's mental health.

Objectives

To investigate the pattern of maternal–foetal relationship during pregnancy, and its relationship to maternal depression and to different sociodemographic and pregnancy-related factors, as well as to the perception of intimate relation with spouse.

Methods

One hundred expectant Egyptian mothers attending obstetric outpatient clinics for regular follow-up of their pregnancy were recruited into the study. They were asked to fill the Maternal–Fetal Attachment Scale (MFAS), the Intimate Bond Measure and the Edinburgh Postnatal Depression Scale.

Results

Maternal antenatal bonding was significantly higher on the MFAS in expectant mothers with longer gestational age. Women with assisted pregnancy had significantly higher scores on the MFAS total score and Role Taking and Attribution subscales. However, if the cause of infertility was unexplained or related to female-oriented factors, the aforementioned MFAS scores tended to be significantly lower than when infertility was related to male-oriented or both factors. Primiparous women had significantly higher scores on the MFAS total score and Role Taking and Differentiation subscales compared with multiparous women. Women who perceived themselves as being healthy had significantly higher scores on the Interaction subscale of MFAS. In this study the intimate relationship with the spouse, and not the marriage duration, showed significant differences in relation to maternal bonding. Expectant mothers who reported a positive attitude towards their marital relationship (Optimal Intimacy and Affectionate Constraint) had significant higher means on the total score of the MFAS and on the Interaction, Giving of Self and Role Taking subscales. The study showed that expectant women with previous loss of foetus and those with no depressive symptoms had better bonding despite the lack of significance.

Conclusion

Maternal antenatal bonding is associated with multiple factors including longer gestational age, parity, previous loss of foetus, assisted pregnancy, perceived good maternal health and intimacy with partner.

Keywords:

antenatal bonding, Edinburgh Postnatal Depression Scale, Intimate Bond Measure, Maternal–Fetal Attachment Scale, maternal–foetal relation

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Introduction

It was believed for many years that attachment between the mother and her child starts in the few hours following delivery (Honjo *et al.*, 2003). As early as 1967 Rubin stated that the immediate bond between a mother and her neonate existed as a result of prenatal processes (Rubin, 1967). However, it was not until the 1980s that research reflected the increasing recognition that the relationship between a mother and her child starts to develop while the child is a foetus. To date, the significance of antenatal

bonding is not as well studied as maternal–infant postpartum bonding (Alhusen, 2008). According to Brockington (1996) this prenatal affiliation develops in a way similar to the mother–infant relationship after birth. Cranley (1981) was the first to create a theoretical construct and an antenatal attachment scale called the Maternal–Fetal Attachment Scale (MFAS), an instrument that continues to be the most frequently used in studies on the antenatal period (Beck, 1999). Although it was developed originally in the USA, the MFAS was used later in different western cultures (Müller and Ferketich,

1992; Seimyr *et al.*, 2009) and in nonwestern countries like Korea (Chang *et al.*, 2004) and Japan (Narita and Maehara, 1993). There is a dearth of research on the maternal–foetal bonding in Egypt and Arab countries. To the best of our knowledge this issue has not been investigated in our culture.

Maternal–foetal bonding has been defined by many researchers as the extent to which women engage in behaviours that represent affiliation and interaction with their unborn child (Cranley, 1981). During pregnancy the expectant mother goes through multiple dynamic psychological and physiological changes that affect her relationship with her unborn child. The maternal–foetal bonding is suggested to be related to three main aspects: cognitive, affective and altruistic. The cognitive component of attachment is related to the desire to know about the infant. The affective component represents the pleasure accompanying thoughts of or interaction with the foetus. The altruistic component is the desire for providing protection to the coming child (Shieh *et al.*, 2001).

With the increasing recognition that maternal–foetal attachment (MFA) is an important requirement for optimal maternal–infant adaptation (Fuller, 1990; Müller, 1996; Bryan, 2000), it is essential for mental health professionals to monitor it as it has important implications for the mental health of both the mother and the person to be (the child). Research has demonstrated a correlation between prenatal and postnatal attachment (Fleming *et al.*, 1988; Müller, 1996). As such, early intervention starts in the antenatal period, particularly as it is well documented that optimal attachment in early infancy is an integral component in the future development of the child (Oppenheim *et al.*, 2007). In addition, there is emerging research suggesting that low levels of prenatal attachment may be related to forms of foetal abuse (Pollock and Percy, 1999; Laxton-Kane and Slade, 2002). In contrast, there is growing evidence that the prevalence of depression during pregnancy is comparable to postpartum rates (Green, 1998; Evans *et al.*, 2001; Austin, 2003, 2004). Hart and McMahon (2006) found that women having low quality of foetal attachment reported significantly higher levels of depression and anxiety (state and trait). Lindgren (2001, 2003) reported that women with lower depression scores had higher levels of MFA and that MFA had significant direct effects on the health practices of mothers.

Aim of the study

To investigate the pattern of maternal–foetal relationship during pregnancy and factors positively and negatively associated with it.

Hypothesis

Maternal antenatal bonding is positively associated with longer gestational period, method of conception and previous loss of foetus or a newly born child and negatively associated with depression and poor marital relationship.

Participants and methods

Study type

This is a cross-sectional descriptive study conducted on a convenient sample.

Site of study

Participants were recruited from six prenatal clinics located in two governorates: Giza and Cairo.

Participants

One hundred expectant Egyptian mothers attending gynaecology and obstetric outpatient clinics for follow-up of their pregnancy between October 2010 and June 2011 were selected for the study. Exclusion criteria were participants suffering from life-threatening conditions or threatened abortion. A verbal explanation of the purpose of the study and of the questionnaires and forms entailed in the study was given. Those who agreed to participate were given the questionnaires to be filled in without assistance from the prenatal clinic team.

Tools

A structured information sheet covering the following:

- (1) *Sociodemographic*: data about both parents, pertaining to age, education, occupation and duration of marriage.
- (2) *Pregnancy*: duration of pregnancy; if current pregnancy is wanted, planned; mode of conception; mother's health during pregnancy; desired sex; expected sex if known; number of foetuses; previous pregnancies; previous miscarriages or loss of baby.

The Maternal–Fetal Attachment Scale (Cranley, 1981)

The MFAS version used is a 22-item scale (Brockington, 1996) scored on a five-point scale from 1 (definitely not) to 5 (definitely yes), with 5 being the most positive statement. It consists of five subscales:

- (1) Role Taking: three items.
- (2) Differentiation of Self from Fetus: three items.
- (3) Interaction with Fetus: six items.
- (4) Attributing Characteristics to Fetus: five items.
- (5) Giving of Self: five items.

*The Edinburgh Postnatal Depression Scale (Cox *et al.*, 1987)*

This is a self-reporting 10-item questionnaire scored on a four-point scale from zero to three specifically designed to screen for postnatal depression in community samples. Five of the items concern dysphoric mood, two concern anxiety and the remaining items deal with guilt, suicidal ideation and an inability to cope.

The authors recommend a cut-off score of 9/10 for screening purposes for women in the postpartum period (Cox *et al.*, 1987). Although the Edinburgh Postnatal Depression Scale (EPDS) was developed specifically for the screening and assessment of postpartum depression, it is now widely used during the entire perinatal period (Brandon *et al.*, 2008).

Both the MFAS and EPDS were translated into Arabic and back translated by the authors and revised with Prof. Ian Brockington, and the Arabic versions were used.

Intimate Bond Measure (Wilhelm and Parker, 1988)

It is a 24-item self-report scale assessing the nature of partner relationship. It comprises two subscales: care and control. The care subscale covers aspects such as affection, consideration and understanding, whereas control assesses the extent to which the participant feels dominated, intruded upon, criticized and controlled by the partner.

Wilhelm and Parker (1988) defined four broad styles of intimate relationships that they label as:

- (1) Optimal Intimacy: high care, low control.
- (2) Affectionate Constraint: high care, high control.
- (3) Affectionless Control: low care, high control.
- (4) Absence of Intimacy: low care, low control.

The scale was translated into Arabic and back translated. Permission to use the scale was obtained by the first author from Kay Wilhelm, after she approved the translation and back translation.

Statistical analysis

Data were statistically analysed using Statistical Package for Social Sciences, version 16 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics for numerical data were means and SD, whereas those for categorical data were number and percentage. Inferential analyses used for quantitative variables were the Student *t*-test and the χ^2 -test for qualitative data. Level of significance was taken at *P* values less than 0.05.

Ethical issues

Study approval was received from the research and ethics committees of the Department of Psychiatry, Cairo University. A verbal consent was obtained from all the participants, describing the objectives of the study and the questionnaires required to be filled. It was clearly stated to all expectant mothers that participation in the study was voluntary and that they had the right to withdraw from the study without affecting their regular care at the obstetric clinics.

Description of participants

Sociodemographic characteristics

Age

The age of the participants ranged from 22 to 43 (mean: 28.86 ± 4.72). Of them, 70.1% ($n = 68$) were in the 21–30 age group and 24.7% ($n = 24$) were in the 31–40 age group. Only 5.2% ($n = 5$) were older than 40 years (Table 1).

Marriage duration

The majority of the participants (50%) had been married for 1–5 years. Of the married participants 22 and 23% had been married for periods less than a year and more than 5 years, respectively.

Table 1 Sociodemographic characteristics

	<i>N</i> (%)
Age ($n = 100$)	
Range: 22–43	
Mean \pm SD: 28.86 ± 4.72	
21–30	68 (68)
31–40	24 (24)
> 40	5 (5)
Unstated	3 (3)
Marriage duration (years) ($n = 100$)	
≤ 1	22 (22)
> 1–5	50 (50)
6–10	17 (17)
> 10	6 (6)
Unstated	5 (5)
Education ($n = 100$)	
Preparatory	1 (1)
Secondary	7 (7)
University	47 (47)
Postgraduate studies	4 (4)
Unstated	41 (41)
Occupation ($n = 100$)	
Housewife	22 (22)
Professional	19 (19)
Managerial and semiprofessional	16 (16)
Skilled	2 (2)
Unstated	41 (41)

Education

Out of the 59 participants who stated their educational level, 86.4% ($n = 51$) were university graduates.

Occupation

In all, 37.2% ($n = 22$) of the participants stated their occupation as housewives, whereas the remaining 62.8% ($n = 37$) were professionals, for example, physicians, pharmacists and engineers; 27.1% ($n = 16$) were in managerial and semiprofessional jobs (e.g. accountants, human resources and public relation employees), and only 3.3% ($n = 2$) were in a skilled job.

Pregnancy-related data

Pregnancy duration

As shown in Table 2, the majority of the participants were in the third (46) or second trimesters (43%). Only 8% were in the first trimester.

Health-related problems

An overall 23% ($n = 23$) reported variable health-related problems (diabetes mellitus, removal of an ovary, hypotension, hyperemesis and perceived poor health). In contrast, 74% ($n = 74$) negated the presence of any health problem and considered themselves healthy.

Parity

In all, 60.9% ($n = 56$) were primiparous, whereas 39.1% ($n = 36$) were multiparous.

Previous foetal or neonatal loss

Of those who answered, 7.5% ($n = 6$) reported previous foetal loss.

Mode of conception

Of those who answered, 45.4% ($n = 44$) had an assisted pregnancy, whereas 54.6% ($n = 53$) reported natural pregnancy.

Table 2 Pregnancy related data

	N (%)
Pregnancy duration	
First trimester	8 (8)
Second trimester	43 (43)
Third Trimester	46 (46)
Health-related problems	
None	74 (74)
Yes ^a	23 (23)
Unstated	3 (3)
Planned pregnancy	
Yes	79 (79)
No	18 (18)
Unstated	3 (3)
Desired pregnancy	
Yes	94 (94)
No	3 (3)
Unstated	3 (3)
First pregnancy	
Yes	56 (56)
No	36 (36)
Unstated	8 (8)
Previous foetal or neonatal loss	
Yes	6 (6)
No	74 (74)
Unstated	20 (20)
Desired sex for mother	
Boy	19 (19)
Girl	27 (27)
Both	5 (5)
No preference	20 (20)
Unstated	29 (29)
Foetus sex	
Boy	26 (26)
Girl	26 (26)
Both	8 (8)
Unstated	40 (40)
Number of foetuses	
1	79 (79)
2	15 (15)
Unstated	6 (6)
Mode of conception	
Natural	53 (53)
Assisted	44 (44)
Unstated	3 (3)
Cause of infertility in assisted pregnancy (n=44)	
Male	21 (47.7)
Female	14 (31.8)
Both	4 (9)
Unexplained	5 (11.4)
Psychiatric history	
Negative	88 (88)
Positive ^b	6 (6)
Unstated	6 (6)

^aDiabetes mellitus, removal of an ovary, hypotension, hyperemesis, poor health.

^bThree reported depression, one anxiety and two nonspecified.

Cause of infertility in assisted pregnancy

Among the 44 participants who had assisted pregnancy, the cause of infertility was due to a male factor in 47.7% ($n = 21$), due to a female factor in 31.8% ($n = 14$) and due to both male and female factors in 9% ($n = 4$). 11.4% ($n = 5$) had infertility due to unexplained factors.

Results

Antenatal bonding as measured by Maternal-Fetal Attachment Scale

As shown in Table 3, the MFAS total scale ranged from 50 to 105, with a mean score of 84.53 ± 11.29 . Table 4 shows the responses of expectant mothers on the MFAS subscales. On the Role Taking subscale, 93% of expectant

Table 3 Maternal-Fetal Attachment Scale total scale and subscale mean scores (n=100)

	Mean	SD	Range
Total	84.53	11.29	50–105
Role Taking	12.87	2.2	6–15
Differentiation of Self from Fetus	12.49	1.79	8–15
Interaction with Fetus	17.44	3.8	8–25
Attributing Characteristics to Fetus	21.84	4.16	9–29
Giving of Self	20.05	3.2	6–25

mothers were eagerly looking forward to holding their babies and 90% were imagining themselves taking care of the baby; however, only 75% were able to picture themselves feeding the baby. On the Differentiation of Self from Fetus subscale 98% of expectant mothers were looking forward to seeing how their baby looks like and about 90% enjoyed watching their tummy jiggle. A higher percentage of expectant mothers had decided on a girl's name (55%) than a boy's (40.8%). On the Interaction with Fetus subscale grasping the foot of the baby through the tummy to move it received the highest percentage of negative answers (76.3%) and was also the question not answered the most number of times (20%). On the Attributing Characteristics to the Fetus subscale, the item that received the highest number of positive answers was wondering whether the baby could hear while inside the mother's womb (92%), followed by whether the child could feel and think (89%). The highest percentage of uncertainty was regarding the implication behind the foetus kicking (33%) and ability to guess the baby's personality from the way he/she moved around (24%). The highest percentage of negative answers concerned the baby getting hiccoughs (56%). On the Giving of Self subscale, 91% of expectant mothers stated that they were engaging in activities to try to stay healthy, which they would not otherwise do had they not been pregnant, with 82% eating meat and vegetables to ensure that the baby gets a good diet and 84% giving up certain habits to help their baby grow healthy; 88% of the participants felt that all the trouble of being pregnant was worth it, whereas 52% felt that their body was ugly.

Sociodemographic correlates of antenatal bonding

Maternal bonding across age

The mean values obtained by the different age groups did not differ significantly. However, the older group tended to obtain higher mean scores on the total scale as well as on the Role Taking and Attribution subscales (Table 5).

Maternal bonding according to marriage duration

Bonding did not differ significantly with the duration of marriage of expectant mothers. However, as shown in Table 6, there was a tendency for those married for more than 10 years to obtain higher mean scores on the total scale and all subscales except the Differentiation subscale.

Pregnancy-related correlates of antenatal bonding

Maternal bonding across pregnancy

Expectant mothers with longer gestational periods (in the third trimester) obtained significantly higher mean scores

Table 4 Distribution of answers to the items of Maternal-Fetal Attachment Scale according to subscales

	N (%)				
	Definitely yes	Yes	Uncertain	No	Definitely no
Role Taking					
4 Picture myself feeding baby (n=98)	43 (42.2)	32 (31.4)	8 (7.8)	14 (13.7)	1 (1)
8 Imagine myself taking care of baby (n=98)	48 (49)	39 (39.8)	6 (6.1)	5 (5.1)	0 (0)
17 Can hardly wait to hold baby (n=100)	59 (59)	34 (34)	5 (5)	1 (1)	1 (1)
Differentiation of Self from Fetus					
3 Enjoy watch tummy jiggle as baby kicks (n=97)	61 (61.9)	27 (27.8)	6 (5.9)	4 (4.4)	0 (0)
5 Looking forward to see how the baby look (n=100)	75 (75)	23 (23)	1 (1)	1 (1)	0 (0)
10 Decided on a name for a girl (n=98)	19 (19.7)	35 (35.7)	7 (7.1)	3 (33.7)	4 (4.1)
3 Enjoy watch tummy jiggle as baby kicks (n=97)	61 (61.9)	27 (27.8)	6 (5.9)	4 (4.4)	0 (0)
Interaction with Fetus					
1 Talk to my unborn baby (n=100)	41 (41)	45 (45)	2 (2)	1 (1)	1 (1)
7 Refer to baby by nickname (n=98)	33 (33.7)	35 (35.7)	7 (7.1)	23 (23.5)	0 (0)
16 I poke to get him/her to poke back (n=96)	17 (17.7)	38 (39.6)	4 (4.2)	36 (37.5)	1 (1)
18 I stroke my tummy to quite baby (n=97)	34 (35.1)	37 (38.1)	9 (9.3)	16 (16.5)	1 (1)
22 I grasp baby foot to move it around (n=80)	3 (3.8)	6 (7.8)	10 (12.5)	50 (62.5)	11 (13.8)
Attributing Characteristics to Fetus					
6 Wonder if baby feels cramped in there (n=100)	28 (28)	42 (42)	9 (9)	19 (19)	2 (2)
9 Can guess what my baby's personality will be (n=99)	25 (25.3)	27 (27.3)	24 (24.2)	17 (17.2)	6 (6.1)
12 Wonder if baby can hear inside (n=100)	36 (36)	56 (56)	2 (2)	6 (6)	0 (0)
13 Wonder if baby thinks and feels inside (n=98)	34 (34.7)	53 (54.1)	5 (5.1)	6 (6.1)	0 (0)
15 Baby kicks to tell me it is eating time (n=97)	18 (18.6)	32 (33)	32 (33)	12 (12.4)	3 (3.1)
19 Can tell baby has hiccoughs (n=98)	7 (7.1)	20 (20.4)	16 (16.3)	41 (41.8)	14 (14.3)
Giving of Self					
2 Feel the trouble of being pregnant is worth it (n=98)	54 (55.1)	32 (32.7)	8 (8.2)	3 (3.1)	1 (1)
11 Do things to stay healthy (n=100)	42 (42)	49 (49)	4 (4)	4 (4)	1 (1)
14 I eat meat and vegetable to be sure my baby gets good diet (n=100)	41 (41)	41 (41)	9 (9)	9 (9)	0 (0)
20 Feel my body is ugly (n=99)	21 (21.2)	31 (31.3)	16 (16.2)	28 (28.3)	3 (3)
21 Give up doing things to help my baby (n=99)	33 (33.3)	50 (50.5)	6 (6.1)	9 (9.1)	1 (1)

Table 5 Maternal bonding across age

	21-30 years	31-40 years	>41 years	F	P
Total	85.43 ± 11.95	82.52 ± 9.34	85.6 ± 13.63	0.589	0.557
Role Taking	13.01 ± 2.21	12.25 ± 2.33	14.6 ± 1.67	2.627	0.078
Differentiation	12.57 ± 1.89	12.25 ± 1.59	12.4 ± 1.52	0.291	0.748
Interaction	17.97 ± 3.83	15.81 ± 3.35	17.4 ± 4.56	2.931	0.058
Attribution	21.98 ± 4.43	21.71 ± 2.99	23.4 ± 3.71	0.354	0.703
Giving of Self	19.95 ± 3.38	20.5 ± 2.67	20.2 ± 2.17	0.265	0.768

on the whole scale as well as on all the different subscales (Table 7).

Maternal bonding according to mode of conception

Expectant mothers with assisted conception obtained significantly higher means on the total scale and the subscales of Role Taking, Interaction with Fetus and Attributing Characteristics to Fetus. Those who conceived normally did not differ from those with assisted conception on Differentiation and Giving of Self subscales (Table 8).

Maternal bonding according to cause of infertility

The mean scores differed significantly according to the cause of infertility on the scale as a whole and on two subscales, namely, the Role Taking and the Attribution subscales. Higher means were obtained in case of male-oriented factors or if both spouses had a problem than if the reason for infertility had been a female-oriented factor or was unexplained (Table 9).

Maternal bonding according to previous loss of foetus or neonate

Those who reported previous loss of a foetus or a neonate obtained lower means on all subscales except

the Interaction subscale, in which they scored higher; however, all differences were statistically insignificant (Table 10).

Maternal bonding according to parity

Expectant mothers who were pregnant for the first time obtained a significantly higher mean score compared with multiparous mothers on the scale as a whole, as well as on the subscales of Role Taking and Differentiation (Table 11).

Maternal bonding according to mothers' health during pregnancy

Expectant mothers reporting poor health or health-related problems during their pregnancy obtained lower means except on the Differentiation subscale; however, the difference was statistically significant only on the Interaction subscale (Table 12).

Perception of expectant mothers of their marital relation on Intimate Bond Measure

The most frequent style of marital relationship as perceived by the expectant mothers was Affectionate Constraint (36.6%, n = 23), followed by Absent Intimacy (25.4%). Optimal Intimacy and Affectionless Control were represented equally (19%).

Bonding according to style of intimate relation as perceived by expectant mothers

Comparing the four styles of intimate relation, the Affectionate Constraint group (high care, high control) showed significantly higher total MFAS mean scores as well as higher scores on Interaction and Giving of Self. As shown in Table 13 the optimal style group showed significantly higher Role Taking mean scores.

Table 6 Maternal bonding according to marriage duration

	< 1 year	1–5 years	> 5–10	> 10 years	F	P
Total	83.63 ± 11.68	84.96 ± 11.84	84 ± 11.7	89 ± 8.49	0.364	0.779
Role Taking	13.11 ± 2.02	12.94 ± 2.09	12.82 ± 3.26	13 ± 1.55	0.057	0.982
Differentiation	12.64 ± 1.68	12.48 ± 1.76	12.52 ± 1.97	11.5 ± 2.07	0.649	0.586
Interaction	17.3 ± 4.93	17.94 ± 3.43	15.47 ± 3.52	19.17 ± 2.2	2.243	0.089
Attribution	20.63 ± 3.89	22.1 ± 4.38	22.47 ± 3.6	25 ± 1.9	2.035	0.115
Giving of Self	20 ± 2.94	19.76 ± 3.42	20.82 ± 2.94	20.3 ± 2.25	0.493	0.688

Table 7 Maternal bonding across pregnancy (n=97)

	First trimester	Second trimester	Third trimester	F	P
Total	72.24 ± 12.81	83.76 ± 9.6	87.6 ± 11.22	6.817	0.002
Role Taking	11 ± 2.62	13.13 ± 1.92	13.13 ± 1.67	3.78	0.026
Differentiation	10.25 ± 1.49	12.53 ± 1.74	12.87 ± 1.56	8.755	0.000
Interaction	15.88 ± 4.11	16.6 ± 3.71	18.47 ± 3.72	3.495	0.034
Attribution	18.19 ± 4.37	21.88 ± 3.58	22.48 ± 4.37	3.865	0.024
Giving of Self	17.53 ± 4.81	19.84 ± 3.04	20.87 ± 2.72	4.084	0.020

Table 8 Bonding according to the way of conception (n=97)

	Assisted	Normal	t	P
Total	86.62 ± 11.87	81.48 ± 9.99	3.22	0.002
Role Taking	13.79 ± 1.49	12.16 ± 2.48	3.836	0.000
Differentiation	12.41 ± 1.91	12.55 ± 1.7	-0.376	0.708
Interaction	18.33 ± 3.5	16.64 ± 3.94	2.205	0.03
Attribution	23.73 ± 4.13	20.55 ± 3.42	4.151	0.000
Giving of Self	20.72 ± 3.39	19.58 ± 2.87	1.79	0.076

Maternal bonding in relation to depression

Out of the 100 participants 96 answered the EPDS. Applying the cut-off score of above nine points, 59.4% ($n = 57$) of participants were scored as depressed. There were no significant differences between those who were scored as depressed on the EPDS and those who did not on the MFAS scale as a whole or on any of its subscales. However, the nondepressed group tended to score higher mean values than the depressed group except on Differentiation and Giving of Self subscales (Table 14).

Discussion

This study showed that the antenatal bonding was significantly higher on the MFAS total score and on all subscales in expectant mothers with longer gestational periods. This is in line with the works of Grace (1989), Heidrich and Cranley (1989), Lerum and LoBiondo-Wood (1989), Righetti *et al.* (2005), Tsartsara and Johnson (2006) and Hjelmstedt *et al.* (2006), in which gestational age was consistently demonstrated to have significant correlation with maternal development of antenatal bonding. A plausible explanation is that the longer the gestational age, the more likely the mother will adapt to the new role transition and progress in the attachment process with her unborn child.

This study showed that the mode of conception has an impact on antenatal bonding. Gravida with assisted conception (44% of the sample) had significantly higher scores on the MFAS total score as well as on the Role Taking and Attribution subscales. As suggested by Alhusen (2008) these women with long-awaited pregnancies usually suffer from lengthy periods of infertility, thereby raising

their investment in the pregnancy and their perception of the foetus as being precious. This finding is consistent with the studies by Eugster and Vingerhoets (1999) and McMahon *et al.* (2011) who reported the presence of significant association between assisted conception and more intense foetal attachment. In contrast, Hjelmstedt *et al.* (2006) found no significant differences in maternal bonding between women who conceived by means of in-vitro fertilization versus those who conceived naturally.

It is noteworthy that the cause of infertility in women with assisted pregnancy had a significant impact on maternal bonding. In this study, statistically significant lower mean scores on the total MFAS and on the Role Taking and Attribution subscales were observed if the cause of infertility was unexplained or was due to factors related to the female partner. This could be attributed to the fact that stress levels may be higher in gravidas when they are the cause of infertility. When the reason for infertility is unknown, women tend to be blamed in our culture, adding to their stress and possibly affecting the ability to bond with the unborn child. The different dynamics underlying each cause of infertility seem an interesting area that needs in-depth study.

In the current study, primiparous women had significantly higher scores on the MFAS total score and on the Role Taking and Differentiation subscales than did multiparous women. The higher bonding in mothers who were pregnant for the first time may indicate their eagerness to assume a new role that had never been experienced before. This is consistent with the study by Grace (1989) and the meta-analytic study by Yarcheski *et al.* (2009) that reported that parity correlated negatively with antenatal bonding and is considered one of the predictors of MFA.

Although a significant difference was not found in the total scores on MFAS among the mothers based on the presence or absence of a previous loss of a foetus, the mothers with previous loss had lower bonding. This may reflect the mothers' worries that affected MFA. This is in line with the study by Armstrong and Hutti (1998) who reported that expectant mothers with previous loss of a foetus had significantly greater levels of anxiety and significantly lower

Table 9 Maternal bonding according to the cause of infertility

	Male factor	Female factor	Both	Unexplained	F	P
Total	91.55 ± 9.03	85.77 ± 16.4	89.76 ± 5.6	83.6 ± 9.94	3.8	0.007
Role Taking	14.14 ± 1.11	13.21 ± 1.76	14.25 ± 1.5	13.6 ± 1.95	4.348	0.003
Differentiation	12.9 ± 2.05	12.5 ± 1.83	11.0 ± 1.41	11.2 ± 0.85	1.689	0.159
Interaction	18.67 ± 3.41	18.46 ± 4.03	18.75 ± 1.5	16.2 ± 3.77	1.578	0.186
Attribution	24.48 ± 3.06	22.57 ± 5.75	25.78 ± 2.1	22.2 ± 3.42	5.847	0.000
Giving of Self	21.42 ± 2.61	19.81 ± 2.61	20.75 ± 1.5	20.4 ± 3.44	1.447	0.225

Table 10 Maternal bonding according to previous loss of foetus or neonate

	No loss	Loss	t	P
Total	85.54 ± 11.1	80.54 ± 16.74	1.018	0.312
Role Taking	13.1 ± 2.15	12.17 ± 3.37	0.981	0.330
Differentiation	12.62 ± 1.8	11.67 ± 1.75	1.250	0.215
Interaction	17.44 ± 3.85	19 ± 3.36	-0.960	0.340
Attribution	22.35 ± 3.95	20 ± 6.07	1.343	0.183
Giving of Self	20.24 ± 2.95	17.71 ± 5.68	1.866	0.066

Table 11 Maternal bonding according to parity

	Primiparous	Multiparous	t	P
Total	87.24 ± 10.77	81.73 ± 11.25	2.235	0.021
Role Taking	13.44 ± 1.91	12.14 ± 2.45	2.722	0.008
Differentiation	12.88 ± 1.74	12.03 ± 1.75	2.121	0.037
Interaction	17.9 ± 3.79	16.91 ± 3.71	1.221	0.225
Attribution	22.62 ± 4.23	21.19 ± 3.78	1.646	0.103
Giving of Self	20.65 ± 2.85	19.39 ± 3.46	1.898	0.061

Table 12 Maternal bonding according to mothers' health during pregnancy

	Good	Poor	t	P
Total	85.44 ± 11.39	82.41 ± 11.37	1.113	0.269
Role Taking	12.98 ± 2.05	12.65 ± 2.77	0.615	0.542
Differentiation	12.39 ± 1.78	12.78 ± 1.83	0.113	0.364
Interaction	17.84 ± 3.9	16 ± 3	2.051	0.043
Attribution	22.1 ± 4.01	21.54 ± 4.29	0.599	0.55
Giving of Self	20.15 ± 3.36	19.96 ± 2.4	0.252	0.801

levels of prenatal attachment. The review by Alhusen (2008) showed that several studies have reported that MFA is lower in women with previous loss. The explanation given is that when a mother experiences such a loss she may grieve for a long time, and a subsequent pregnancy may evoke a degree of apprehension, thereby disrupting attachment. This is also in line with the study by Tsartsara and Johnson (2006) who stated that women with a history of miscarriage reported significantly higher pregnancy-specific anxiety at the first trimester. It is worthy to investigate the impact of worries and anxieties on maternal bonding in future studies.

This study showed that maternal bonding tended to be associated with older age of mothers, despite the lack of significance. This finding is consistent with the work of McMahon *et al.* (2011) who reported that older mothers appeared to have some psychological advantages over their younger counterparts. They tended to be more resilient and reported lower symptoms of depression and anxiety during pregnancy. This may give them an advantage in bonding with their infants.

Although participants with life-threatening conditions were excluded from the sample, other participants with general medical conditions ($n = 23$) were included, unlike most other research work that studied bonding only among healthy mothers (Brandon *et al.*, 2008). This enabled the study to examine the effect of poor general health of mothers on bonding with their unborn children. In the current study, expectant mothers with poor general health obtained statistically significant lower mean scores on the Interaction subscale of MFAS. This finding suggests that healthcare providers for pregnant women may have to assess antenatal attachment especially when the mother does not perceive herself as healthy. It might be recommended that these women be educated about the importance of interaction by talking and playing with their foetuses, which may reflect in better attachment and healthy relation with the infants in the future (Ahern and Ruland, 2003). In Alhusen's (2008) critical review of literature, it was found that MFA predicts engagement in health practices such as attending prenatal care, maintaining a nutritionally sound diet, and getting regular exercise that reflected positively on the mothers' health and in greater MFA.

In this study, intimate relations with the spouse, and not marriage duration, showed significant differences in maternal bonding. This may point to the importance of marriage perception as a quality, not just its duration. This is in line with the work of Cranley (1981) and Wilson *et al.* (2000) who concluded that social support, not necessarily marriage duration, may influence attachment.

In this study expectant mothers who reported a positive attitude towards their marital relation (Optimal Intimacy and Affectionate Constraint) had significantly higher mean scores on the total score of the MFAS as well as on the Interaction, Giving of self and Role Taking subscales. This finding is in line with most of the literature that reported good marital relation and social support as important predictors of antenatal bonding (Yarcheski *et al.*, 2009).

Although a significant difference was not found between the depressed and nondepressed groups of expectant mothers on the MFAS total score or on any of its subscales, it is noteworthy that the depressed group tended to have lower mean scores than the nondepressed group. A consistently reported finding of studies by Robertson *et al.* (2004), Seimyr *et al.* (2009) and McFarland *et al.* (2011) is that mothers with depressive symptoms are less positive about their pregnancy and show lower scores on MFAS. Further, Brandon *et al.* (2008) stated that mothers showing strong MFA reported less depressive symptoms.

Table 13 Bonding according to style of intimate relation as perceived by expecting mothers

	Absent	Affectionless	Affectionate	Optimal	F	P
Total	84.4 ± 10.25	78.7 ± 12.15	90.9 ± 10.47	85.8 ± 7.5	4.335	0.007
Role Taking	12.59 ± 2.57	12 ± 2.85	13.58 ± 1.72	14.07 ± 0.96	3.058	0.034
Differentiation	12.47 ± 1.42	11.77 ± 1.83	12.69 ± 1.87	12.8 ± 1.93	0.974	0.410
Interaction	16.8 ± 3.04	16.08 ± 3.57	19.38 ± 3.32	16.6 ± 3.36	4.211	0.009
Attribution	22.94 ± 3.51	20.62 ± 3.93	23.85 ± 3.6	22.97 ± 3.2	2.268	0.089
Giving of Self	19.76 ± 2.59	19.15 ± 2.94	21.41 ± 2.56	19.4 ± 2.5	3.146	0.031

Table 14 Maternal bonding in relation to depression (n=96)

	Nondepressed	Depressed	t	P
Total	85.38 ± 11.69	84.07 ± 11.28	0.550	0.584
Role Taking	13.26 ± 1.85	12.78 ± 2.25	1.091	0.278
Differentiation	12.46 ± 1.76	12.51 ± 1.82	-0.126	0.90
Interaction	17.56 ± 3.84	17.25 ± 3.88	0.378	0.706
Attribution	22.33 ± 4.53	21.58 ± 3.95	0.868	0.388
Giving of Self	19.84 ± 3.71	20.18 ± 2.91	-0.490	0.625

Clinical implications

When poor levels of MFA are identified during the course of pregnancy, appropriate interventions should be implemented to assist the expectant mother to achieve a physically and psychologically sound pregnancy in an effort to best optimize maternal and foetal health.

When factors known to threaten MFA, such as depression, anxiety, substance abuse and lack of social support, are present or suspected, both mental and maternity health-care communication is highly advised. Together, an early and effective intervention can be implemented.

Research implications

Future studies should include longitudinal designs to enhance our understanding of the maternal-foetal relationship over time. A prospective study using a larger, randomly selected sample to examine the development of maternal bonding across the gestational period and postnatal period would aid in studying the relationship between antenatal attachment and postnatal bonding with the infant and allow generalization.

It is recommended to perform further studies to investigate the presence of anxiety and depressive subthreshold symptoms and clinical diagnoses among expectant women and their impact on the process of maternal-foetal bonding.

It is worth studying the bonding before and after performing an ultrasound. The option and ability to view the foetus as an independent being at an earlier point in pregnancy is likely to contribute to the development of maternal-foetal relationship at a much earlier point in foetal development.

Further research on high-risk pregnancy mothers is needed for adding knowledge to the interplay between obstetric complications and development of antenatal bonding.

Study limitations

The cross-sectional design of the study prevented causal inferences. In addition, this study recruited a convenient sample with a relatively high level of education. The participants in this study were well educated. Of the

women in this study 51% reported a university degree or above. This does not represent the level of education in the Egyptian population. The last census in 2006 reported that only 8% of Egyptian women had a university degree or above (Central Agency for Public Mobilization and Statistics (CAPMAS, 2006). This discrepancy may limit the generalizability of the study results.

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Conflicts of interest

There are no conflicts of interest.

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