

## Socio-economic and partner relationship factors associated with antenatal depressive morbidity among pregnant women in Dar es Salaam, Tanzania

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**Abstract:** Depression during pregnancy may negatively influence social functioning, birth outcomes and postnatal mental health. A cross-sectional analysis of the baseline survey of a prospective study was undertaken with an objective of determining the prevalence and socio-demographic factors associated with depressive morbidity during pregnancy in a Tanzanian peri-urban setting. Seven hundred and eighty seven second to third trimester pregnant women were recruited at booking for antenatal care at two primary health care clinics. Prenatal structured interviews assessed socio-economic, quality of partner relationships and selected physical health measures. Depressive symptoms were measured at recruitment and three and eight months postpartum using the Kiswahili version of the Hopkins Symptom Checklist. Completed antenatal measures available for 76.2% participants, showed a 39.5% prevalence of depression. Having a previous depressive episode (OR 4.35,  $P<0.01$ ), low (OR 2.18,  $P<0.01$ ) or moderate (OR 1.86,  $P=0.04$ ) satisfaction with ability to access basic needs, conflicts with the current partner (OR 1.89,  $P<0.01$ ), or booking earlier for antenatal care (OR 1.87,  $P=0.02$ ) were independent predictors of antenatal depression in the logistic regression model; together explaining 21% of variance in depression scores. Attenuation of strength of multivariate associations suggests confounding between the independent risk factors and socio-demographic and economic measures. In conclusion, clinically significant depressive symptoms are common in mid and late trimester antenatal clinic attendees. Interventions for early recognition of depression should target women with a history of previous depressive episodes or low satisfaction with ability to access basic needs, conflict in partner relationships and relatively earlier booking for antenatal care. Findings support a recommendation that antenatal services consider integrating screening for depression in routine antenatal care.

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**Key words:** pregnancy, depression, socio-economic adversity, Tanzania

### Introduction

Studies show the second and third trimester of pregnancy poses risk for depression, with findings of meta-analysis estimating point prevalence of 12.8% and 12.0% respectively (Bennet *et al.*, 2004). Rates of depression during pregnancy are perhaps higher or comparable to rates in the postnatal period when assessed using screening (Josefsson *et al.*, 2001; Haas *et al.*, 2004; Edge *et al.*, 2004; Wissart *et al.*, 2005; Rich-Edwards *et al.*, 2006; Limlomwongse &

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Liabsuetrakul, 2006) or diagnostic interviews (Kitamura *et al.*, 2006). A continuum of disorder from the antenatal period is likely as studies show about a third of postnatal depressive episodes have onset during pregnancy (Johanson *et al.*, 2000; Kitamura *et al.*, 2006; Felice *et al.*, 2007). Some evidence shows most depressed pregnant women do not receive specific treatment (Marcus *et al.*, 2003; Carter *et al.*, 2005).

Depression during pregnancy may negatively influence social and personal adjustment, marital relationships (Kazi *et al.*, 2006; Hart *et al.*, 2006) and the mother-infant interaction (Murray *et al.*, 2001; Koubovec *et al.*, 2005) through influences on the occurrence of postnatal depression. Studies also show associations between antenatal depression and poor infant outcomes (low birth weight, preterm delivery or both) in low (Rahman *et al.*, 2004; Patel, 2006; Rahman *et al.*, 2007) and middle-income countries (Rondo *et al.*, 2003). In high-income countries, findings of associations between antenatal depression and infant outcomes are limited (Perkin *et al.*, 1993; Hoffman & Hatch, 2000; Andersson *et al.*, 2004), except in economically disadvantaged women (Hickey *et al.*, 1995; Rini *et al.*, 1999; Hoffman & Hatch, 2000). Lack of recognition or treatment of depression during pregnancy may increase the risk of poor nutrition and ability to follow through health care recommendations including limiting alcohol, smoking and substance abuse, all of which can potentially result in adverse perinatal outcomes (Hoffman & Hatch, 2000; Chung *et al.*, 2001; Larsson *et al.*, 2004).

In sub-Saharan African (SSA), antenatal care settings, high prevalence of physical health problems, pose unique challenges to recognition of depression during pregnancy. Anaemia, for example, occurs in 16.0-26.0% of antenatal care attendees in Tanzania (Massawe *et al.*, 1999; Nganda *et al.*, 2004), and can present with fatigue, weakness and tiredness, symptoms that are also associated with depressive morbidity. A Nigerian study suggests higher depressive symptom endorsement in pregnant compared to matched non-pregnant women (Fatoye *et al.*, 2004). The few, prevalence studies among pregnant women in SSA suggest probable or definite psychiatric morbidity is high, with rates ranging from 19.0% to 42.0% (Aderibigbe *et al.*, 1993; Nhiwatiwa *et al.*, 1998; Adewuya *et al.*, 2007). Nhiwatiwa *et al.*, (1998), used a locally validated screening tool in Zimbabwe, to show 19% prevalence of probable antenatal psychiatry morbidity, with half of those affected reporting depressed mood, anxiety, worry fatigue and sleep disturbances. Adewuya *et al.* (2007) showed a 42% prevalence of significant depressive symptoms in peri-urban third-trimester pregnant women in Nigeria and an 8.0% prevalence of depressive disorder.

There is some evidence that primary care health workers in SSA, who are the main providers of antenatal services, poorly recognize depression (Gureje *et al.*, 1997; Whyte, 2001). Knowledge of psychosocial risk factors for antenatal depression in these settings can alert providers to the possibility of depressive disorder. Studies show several psychosocial predictors of antenatal depression. More immediate proximal factors include marital satisfaction or conflict (Rich-Edwards *et al.*, 2006; Records & Rice, 2007; Adewuya *et al.*, 2007), inadequate social support (Pajulo *et al.*, 2001; Records & Rice, 2007), and single motherhood (Limlomwongse & Liabsuetrakul, 2006; Faisal-Curry *et al.*, 2007; Adewuya *et al.*, 2007). More distal or longer-term factors include history of smoking (Chen *et al.*, 2004; Marcus *et al.*, 2003; Kitamura *et al.*, 1996), and childhood abuse (Farber *et al.*, 1996). Low socio-economic status defined by level of education, income or employment status, has been associated with antenatal depression in some studies (Hoffman *et al.*, 2000; Marcus *et al.*, 2003; Haas *et al.*, 2005; Lovisi *et al.*, 2005; Faisal-Curry *et al.*, 2007). Two SSA studies did not find associations between antenatal depression and socio-economic status; however, socio-

economic status measures were unclear or relied on occupation status of participants or partners (Fatoye *et al.*, 2004; Adewuya *et al.*, 2007). Formative studies can help generate locally sensitive socio-economic measures, as observed by Patel (1998), who among women in Zimbabwe associations between common mental disorders and locally subjective (inability to purchase food) and objective (lack of financial savings) socio-economic status measures. The aims of this study were to estimate the prevalence of significant depressive symptoms in pregnant women booking for care and associations with (i) socio-demographic and economic status measures; and (ii) quality of relationships with current partners and selected general health measures.

## Materials and Methods

### *Study design and participants*

A mixed methods study with formative qualitative and a prospective survey was conducted in the Chamazi and Mbagala peri-urban wards in Dar es Salaam City, Tanzania. A formative phase conducted unstructured interviews with community leaders, women key informants and traditional practitioners; and information derived used to develop sensitive quantitative survey measures. The prospective survey recruited a cohort of 787 consecutive antenatal care attendees registering for care at two clinics serving the wards. Survey participants were included if gestational age was 32 weeks or less, planned residence in Dar es Salaam for at least a year post delivery and intentions to attend infant growth monitoring visits at the clinics.

Socio-demographic, economic, and reproductive and other health status measures, were collected at study recruitment and quality of relationship with the partner was assessed 4-6 months later at 36 weeks gestation. Participant had to indicate their age, marital and education status, parity, and the number of children below the age of 18 years in the home. To index socio-economic status, we assessed engagement in the past year in activities that earned cash income, household assets and characteristics, and satisfaction with participant's ability to access basic needs.

*Household assets and characteristics:* The formative study identified ten household assets and characteristics as indicators of wealth. These included four characteristics (having a cement screed floor, a wooden external door, concrete brick walls and corrugated iron sheet roofing) and six assets (owning a bicycle, television, refrigerator, car or motorbike, radio and a vendor's kiosk or shop). Participants had to indicate if their household included these aspects. Affirmative responses were scored one and negative responses zero.

*Satisfaction with ability to access basic needs:* A set of questions required respondents to indicate satisfaction with their personal ability to access four basic needs in the previous 12 months. These included to: 1) cook at least one meal a day 2) purchase clothes for self 3) purchase sufficient amount of food for household 4) live in the type of accommodation they desired. Responses to satisfaction items ranged from one "not at all" to four "very satisfied".

*Relationship Quality:* Individual items assessing partner relationship quality included participant's perception of the overall quality of relationship with their current partner, rated on a 3-point scale from very good (1) to poor (3). Also assessed was presence or not of conflicts with their current partner/spouse during the previous 12 months using a 3-point scale from no conflicts (1), verbal conflicts (2) and any physical confrontations (3); and presence or absence of partner fidelity during the same time frame (responses yes, unsure or no). Practical help from partners during the index pregnancy assessed by a single item

explored partner's involvement in any of two household chores (fetching water and firewood/coal for cooking and assisting in cooking and cleaning) with yes or no response options. The formative phase showed the degree of a woman's autonomy/involvement in decisions related to household expenditure suggested greater respect from her partner/spouse. Women responded to items assessing involvement in the previous year in decisions related expenditure on: 1) health care of family members, 2) food, and 3) other household purchases and responses including decisions made alone, shared with partner, made by partner alone or other person(s).

*Reproductive and other health measures:* Reproductive health measures included gestational age at booking for antenatal care, history of any abortions (defined as foetal loss before 28 weeks gestation) or stillbirths. Since alcohol use may be a correlate of depression and relationship quality (Salokangas, 1998; Flynn, 2007), participants responded to questions on lifetime alcohol use (selves and partner) and frequency of partner's alcohol use. Other measures included life-time and past year experience of depressed mood (lasting two weeks or more) assessed using the Rost two-item screener (Rost *et al.*, 1993), blood haemoglobin level and microscopic evidence of malaria parasites on Field stained thin blood slides (Chatterjee, 1980).

*Current symptoms of depression:* Assessment of current depressive symptoms at recruitment was by face-to-face interviews with a Kiswahili adapted version of the Hopkins Symptom Checklist (KHSCL). The KHSCL demonstrated good reliability, convergent and discriminant validity in pregnant women (Lee *et al.*, 2008). In these analyses, depression assessment utilizes a KHSCL version validated against DSM-IV major depression diagnosis in pregnant women in Dar-es-Salaam (Kaaya *et al.* 2002).

### **Study procedures**

The ethics committee of the Muhimbili University College of Health Sciences approved the study. Thematic areas of interest informing development of survey instruments relevant for these analyses include informant's perceptions on indicators of household wealth, and marital and cohabiting relationships during pregnancy. Details of the formative survey design and some findings are described elsewhere (Kaaya *et al.*, 2010).

Pregnant women registering for antenatal care meeting inclusion criteria were consented and interviewed at recruitment. Follow up assessments occurred at 36 weeks gestation and at 6-12 weeks and 8 to 12 months after delivery. In the absence of working laboratories at both clinics, trained research nurse mid-wives collected blood for haemoglobin estimation and prepared thin blood smears from capillary blood draws. A hemocue machine, calibrated after every 10<sup>th</sup> sample, estimated haemoglobin levels onsite at each clinic. Collected thin blood smears assessed at a university research laboratory for presence and type of malaria parasites allowed for results within 1-2 days of preparing blood slides. Assessed blood smears identified *Plasmodium falciparum* in all positive slides. A second slide prepared for every seventh sample collected and sent to a separate laboratory for validation, resulted in 116 separately analyzed pairs, and an 86% concordance rate for detecting presence of malaria parasites.

### **Statistical analysis**

The Statistical Package for the Social Sciences Version 12 (SPSS-12) software program analyzed data. Presented analyses focuses on data from 600 (76.2%) completed antenatal assessments. Missed visits (n=187) were due to residence changes (n=88, 47.1%), discharge

from follow-up (n=52, 27.8%) either due to foetal loss/stillbirth (n=43) or death of the participant and/or the infant (n=9). For 25.1% reasons for missed visits were not available. The distribution of socio-demographic measures (age, education level, marital status, employment in the year prior to assessment), were not significantly different in participants with a single compared to those with both prenatal measures.

Significant depressive morbidity defined as a score at or above 1.06 on the KHSCL and participants scoring below this threshold categorized as not depressed. Categorical summarization of risk factors of interest including socio-demographic, economic, partner relations and health status measures occurred. The mean (SD) household assets and characteristics scores was 4.70 (1.49) and each item was weighted, after extracting three factors that together explaining 57.3% of variance in item scores using principal components analysis. Item standardized scoring coefficients of the first component (28.0% of variance explained), were normalized by item standard deviations and used as weights in the computation of the household wealth status index as described by Filmer and Pritchett (2001). The computed wealth status index was negatively skewed (skewness -1.86; mean score (SD) = 0.90 (0.28)), despite log transformation and summarized as tertiles of wealth; scoring at or below the first and second tertiles was defined as relatively low and moderate household wealth respectively while scoring at or above the third as relatively higher wealth. Individual items assessing satisfaction with ability to access basic needs (values 1-4) were positively correlated (Spearman's  $\rho$  0.36 - 0.59; all p values <0.01) and combined in a single summed satisfaction measure that had a mean score (SD) of 2.86 (0.51); higher mean scores indicating greater satisfaction. The satisfaction scale had adequate internal consistency with a Cronbach's alpha score of 0.79, but was negatively skewed (-0.83) this not being improved by log transformation. Tertiles summarized the satisfaction scale, the first to third defined as lower, moderate and higher satisfaction respectively for these analyses.

Items assessing respondent's involvement in decisions related to household expenditure were highly correlated (Spearman's  $\rho$  0.88 - 0.92) and due to its higher variability, analysis focused on one item, involvement in expenditure decisions related to a family member's health care. Conflict with the current partner was coded "yes" if respondent reported frequent verbal or any physical confrontation and "no" if these responses were not endorsed. Measures for lifetime depressive episodes (present or absent), baseline haemoglobin (11gm/dl and above normal and low if below 11 gm/dl) presence or absence of malaria parasites in thin blood smear were also dichotomized. Frequencies (percentage) and mean scores (SD) where appropriate are reported for both current depressive symptoms and independent variable measures. Chi-Square estimates assessed variance and significance determined at  $p < 0.05$ ; Odds ratios and 95% Confidence Intervals (CI) are also reported. Independent variables associated with baseline depressive morbidity at p-values of <0.20 were considered for logistic regression analyses (Hosmer & Lemeshow, 2000). A backwards removal method including items at p-value 0.05 and removing items at  $p = 0.10$  was utilized after forced entry of demographic variables.

## Results

### *Distribution of socio-demographic, economic, partner relations and health status measures*

Participants were generally young of mean age (SD) 25.1±5.8 years and lived with partners in marital or cohabiting relationships; amongst the 62% (n=372) that knew their partner's age, partners were generally older with mean (SD) age 32.6 ±8.4 years.

**Table 1: Socio-demographic and economic characteristics of pregnant women booking for antenatal care (N=600)**

Characteristic	Response	Total N <sup>1</sup> (%)
Respondents age (years)	20 or younger	158 (26.7)
	21 to 24	144 (24.4)
	25 to 28	138 (23.4)
	29 and older	151 (25.5)
Current partner's age (years)	24 or younger	74 (9.4)
	25 to 34	242 (30.7)
	35 or older	169 (21.4)
	Did not know	303 (38.5)
Marital status	Single/separated/divorced	90 (15.1)
	Married/ cohabiting	507 (84.9)
Years of formal education	None	106 (17.8)
	One to six	90 (15.1)
	Seven or more	401 (67.2)
Employed/self employed in the year prior to assessment	Yes	137 (22.8)
	No	463 (77.2)
Parity	Primigravida	159 (26.5)
	Gravida 1-3	261 (43.5)
	Gravida 4 or more	180 (30.0)
Number of children below 18 years in the home	None	122 (20.4)
	One to three	365 (60.8)
	Four or more	112 (18.7)
Household wealth status	Relatively low	170 (28.4)
	Moderate	197 (32.9)
	Relatively high	232 (38.7)
Tertiles of satisfaction with ability to purchase basic needs in the past year	Low satisfaction	218 (27.7)
	Moderately satisfied	106 (13.5)
	Higher satisfaction	464 (58.9)

Key: <sup>1</sup>Column totals less than 600 indicative of missing responses

Over two thirds had completed seven or more years of formal education, but only 6.4% achieved more than the compulsory seven years of primary education. Less than a fourth were employed in a cash earning activity in the year prior to assessment and 28.4% were categorized as having relatively lower household wealth status. Almost one-third (27.7%) expressed low satisfaction with ability to afford basic needs in the year prior to assessment. More than a quarter were experiencing their first pregnancy and less than a fifth reported four or more children below the age of 18 years living in the home at the time of assessment.

**Table 2: Unadjusted socio-demographic, economic, partner relationship and selected health measures associated with depressive symptoms (N=600)**

Characteristic	Response	Total N (%) <sup>1</sup>	Depressive Symptoms N (%)	OR (95% CI); p-value <sup>4</sup>
<i>Socio-demographic and economic factors</i>				
Number of children below 18 years in the home	None	122 (20.4)	44 (36.1)	1.00
	One to three	365 (60.8)	141 (38.6)	1.12 (0.73, 1.71); 0.61
	Four or more	112 (18.7)	51 (45.5)	1.48 (0.88, 2.50); 0.14
Parity	Primigravida	159 (26.5)	52 (32.7)	1.00
	Gravida 1-3	261 (43.5)	113 (43.3)	1.57 (1.04, 2.37); 0.03

Characteristic	Response	Total N (%) <sup>1</sup>	Depressive Symptoms N (%)	OR (95% CI); p-value <sup>4</sup>
<b><i>Socio-demographic and economic factors</i></b>				
	Gravida 4 or more	180 (30.0)	72 (40.0)	1.37 (0.88, 2.14); 0.17
Employed/self employed in cash earning activity in the year prior to assessment	Yes	137 (22.8)	67 (48.9)	1.65 (1.12, 2.42); 0.01
	No	463 (77.2)	170 (36.7)	1.00
Household wealth status	Relatively low	170 (28.4)	78 (45.9)	1.47 (0.98, 2.19); 0.06
	Moderate	197 (32.9)	73 (37.1)	1.02 (0.69, 1.51); 0.93
	Relatively high	232 (38.7)	85 (36.6)	1.00
Satisfaction with ability to access basic needs in the past year (tertiles)	Low	218 (27.7)	117 (53.7)	2.47 (1.78, 3.44); <0.01
	Moderate	106 (13.5)	51 (48.6)	2.02 (1.31, 3.10); <0.01
	High	464 (58.9)	148 (31.9)	1.00
<b><i>Quality of relationship with partner</i></b>				
Overall assessment of quality of relationship with current partner	Very or moderately good	411 (73.0)	61 (40.1)	1.05 (0.72, 1.54); 0.85
	Poor	152 (27.0)	160 (38.9)	1.00
Partner helped with household chores during index pregnancy	No	254 (42.8)	112 (44.1)	1.39 (1.00, 1.94); 0.05
	Yes	340 (57.2)	123 (36.2)	1.00
Inclusion in decisions on health care expenditure in the past year	No	266 (44.6)	118 (44.4)	1.44 (1.03, 2.00); 0.04
	Yes	331 (55.4)	118 (35.6)	1.00
Misunderstandings or conflicts with partner in the past year	Some	125 (21.8)	68 (54.4)	2.16 (1.45, 3.22); <0.01
	None	475 (79.2)	169 (35.6)	1.00
Partner's fidelity in the past year	Yes	52 (9.1)	26 (50.0)	1.68 (0.90, 3.16); 0.11
	Not sure	387 (64.5)	151 (39.0)	1.08 (0.71, 1.57); 0.70
	No	161 (28.4)	60 (37.3)	1.00
<b><i>Selected health measures</i></b>				
Gestational trimester at baseline	Second	77 (12.8)	41 (53.2)	1.90 (1.17, 3.08); 0.01
	Third	523 (87.2)	196 (37.5)	1.00
Life time experience of a depressive episode <sup>2</sup>	Yes	110 (18.3)	79 (71.8)	5.36 (3.39, 8.45); <0.01
	No	490 (81.7)	158 (32.2)	1.00
Frequency of alcohol use by partner in the past year	≥1 per week	70 (11.7)	33 (47.1)	1.55 (0.93, 2.57); 0.09
	<1 per week	54 (9.0)	30 (55.6)	2.17 (1.23, 3.83); <0.01
	Not at all	476 (79.3)	174 (36.6)	1.00
Malaria parasites at recruitment <sup>3</sup>	Present	118 (19.7)	47 (39.8)	1.04 (0.69, 1.57); 0.87
	Absent	449 (74.8)	175 (39.0)	1.00
Haemoglobin at recruitment (g/dl) <sup>3</sup>	Less than 11 g/dl	403 (67.2)	158 (39.2)	1.00 (0.69, 1.46); 0.97
	11 g/dl or more	164 (27.3)	64 (39.0)	1.00

**Key:** <sup>1</sup> Column totals less than 600 indicative of missing responses; computed % is of total respondents except where indicated

<sup>2</sup> Defined as ever experienced sadness or loss of interest in normal activities almost daily for two weeks or more

<sup>3</sup> 13.7% (n=108) of missing measures; accounted for in the analysis

<sup>4</sup> Univariate analysis odds ratios and 95% confidence intervals (CI); p-value two tailed

Most women (73.0%) reported a moderately to very good relationship with the current partner. In the year prior to assessment more than half reported involvement in decisions

related to expenditure for health care of family members (either solely or with their partner) and receiving practical help from partners relating to household chores. Over a fifth reported some conflicts with partners in the year prior to assessment and less than a third (28.4%) were certain of their partner's fidelity in the year prior to assessment, most (62.6%) being uncertain (Table 2).

Booking for antenatal care generally occurred late, 87.2% booking in the third and none in the first trimester of pregnancy. About a fifth (20.7%) had ever experienced an abortion and 4.7% a stillbirth. A considerable proportion was anaemic at booking for antenatal care with only 27.3% satisfying the WHO recommendation of haemoglobin levels at or above 11g/dl; malaria parasites were present in a fifth of assessed thin blood smears. Over a fifth reported partner's recent (past year) use of alcohol; more than half (56.5%) reporting that partners/spouses drank once weekly or more frequently. Endorsement of previous experience of a depressive episode occurred for 18.8% of the participants and at recruitment 39.5% scored at or above the threshold for depression caseness on the KHSCL and categorized as having probable depressive morbidity.

**Table 3: Sequential logistic regression of significant depressive symptoms on selected socio-demographic, economic, partner relationship and health measures in second and third trimester women booking for antenatal care in Dar es Salaam (N=600)**

Characteristic	Characteristic	Depressive Symptoms N (%) <sup>2</sup>	OR (95% CI); p <sup>3,4</sup>
Life time experience of a depressive episode <sup>1</sup>	Yes	79 (71.8)	4.35 (2.66, 7.11); <0.01
	No	158 (32.2)	1.00
Satisfaction with ability to access basic needs in the past year (tertiles)	Low	92 (53.8)	2.18 (1.43, 3.31); <0.01
	Moderate	33 (50.0)	1.86 (1.04, 3.35); 0.04
	High	110 (30.8)	1.00
Misunderstandings or conflicts with partner in the past year	Frequent verbal /any physical confrontations	68 (54.4)	1.89 (1.21, 2.95); <0.01
	None	162 (36.1)	1.00
Gestational trimester at booking for antenatal care	Second	41 (53.2)	1.87 (1.09, 3.22); 0.02
	Third	196 (37.5)	1.00

**Key:** <sup>1</sup>Defined as ever experienced sadness or loss of interest in normal activities almost daily for two weeks or more

<sup>2</sup>Column totals less than 237 indicative of missing responses

<sup>3</sup>Confidence intervals (CI)

<sup>4</sup>Sequential logistic regression, demographic risk factors (age, parity, number of children in the home) force entered in first block and backwards method used to enter risk factors in second block; Model -2 log likelihood 681.98 Chi sq=95.86, df 13 p<0.01; R<sup>2</sup>. 0.21

### ***Factors associated with probable depressive morbidity***

Univariate analyses identified a number of statistically significant associations with probable depressive morbidity (Table 2). Women reporting a lower satisfaction in abilities to access basic needs, engagement in cash earning employment in the year prior to assessment and one or more previous pregnancies were more likely to endorse symptoms equivalent to depressive disorder. There was an insignificant trend towards a higher likelihood of depressive morbidity with lower compared to higher household wealth status. Age, level of educational attainment and marital/cohabiting status were not significantly associated with



such morbidity. Depression was positively associated with three measures of quality of partner relations: misunderstandings or conflicts in the year prior to assessment, lack of assistance with household chores, and lack of the participant's involvement in decisions on health care expenditures for family members. Associations between reported depressive symptoms and the partner's fidelity were marginal. Of the assessed health measures, lifetime experience of a depressive episode, registering early for antenatal care (in the second trimester of pregnancy) and partner's use of alcohol in the year prior to assessment increased the likelihood of reporting depressive symptoms. Experience of foetal loss, low haemoglobin and presence of malarial parasites in peripheral blood smears did not influence endorsement of depressive symptoms.

Table 3 summarizes multivariate analyses. Forced entry of demographic risk factors (age, parity and number of children in the home) adjusted for their potential influences in a full effects regression model regressing antenatal depression on identified socio-economic, relationship quality and health status measures. Findings showed ever experiencing a depressive episode was the strongest risk factor increasing almost four and a half-fold the likelihood of reporting depressive symptoms (OR = 4.35; 95% CI: 2.66, 7.11). Low and moderate satisfaction with ability to access basic needs both increased the likelihood of depressive symptoms about two fold (OR = 2.18; 95% CI: 1.38, 3.27, and OR = 1.86; 95% CI: 1.01, 3.34, respectively). Early booking for antenatal care or misunderstandings or conflicts with respondent's partner in the year prior to assessment each increased by almost two fold the likelihood of reporting depressive symptoms (OR = 1.87; 95% CI: 1.09, 3.22, and OR = 1.89; 95% CI: 1.21, 2.95, respectively). Attenuation in the strength of multivariate model parameter estimates suggested some confounding between demographic, economic and health risk factors with no significant interaction effect identified. The final model explained a modest 21% of variance in depressive symptoms.

## Discussion

This study is the first to examine prevalence and correlates of depressive morbidity in HIV status naïve pregnant women in Tanzania. Overall, 39.5% had significant depressive morbidity. The observed prevalence rate of antenatal depression is consistent with reports from diverse cultural settings; for example Kazi *et al.* (2006) in Pakistan and Holzman *et al.* (2005) in Michigan, USA show during pregnancy depression prevalence rates of 39.4% and 34.8% respectively. However Faisal-Curry *et al.*, (2007) in Sao Paulo, Brazil, report a much lower antenatal depression rate of 19.6%, though this could be because they recruited clients attending a private health care facility, with relatively higher levels of educational attainment suggesting possible higher socio-economic status. Hence, while differences in screening tools and timing of assessments may partly explain variations in reported prevalence's of depression (Bennet *et al.*, 2004), socio-cultural, social support and economic differences across studies may also be contributory.

As has been shown in other studies (Ross *et al.*, 2004; Marcus *et al.*, 2003) history of a previous episode of depression was independently associated with antenatal depression in multivariate analyses. Experience of previous depressive episodes may indicate biological vulnerability, which indirectly causes pregnancy mood changes through effects on psychosocial stressors and anxiety (Ross *et al.*, 2004; Altshuler *et al.*, 1998). A number of psychosocial risk factors were determined. Perceived low satisfaction with access to basic needs in the previous year was independently associated with antenatal depressive

morbidity. This agrees with findings from other studies that show associations between antenatal depression and subjective economic status measures including perceived lack of money for essentials and self-reported economic difficulties (Pajulo *et al.*, 2001; Haas *et al.*, 2005; Rochat *et al.*, 2006; Holzman *et al.*, 2006). While some studies show associations between antenatal depression and more objective economic status (Faisal-Cury *et al.*, 2007) or standard of living (Baker *et al.*, 1997) this was not the case in these analyses, perhaps due to the limited differentials in education attainment and household wealth status.

Reported recent partner conflicts were independently associated with antenatal depression. There is consistent international evidence that the quality of relationship between pregnant women and intimate partners is a determinant of mood. Mood disturbances have been associated with partner coercion (control, criticism and efforts to change her) (Fisher *et al.* 2007); domestic/intimate partner violence (Ferri *et al.*, 2007; Flynn *et al.*, 2007; Varma *et al.*, 2007; Thananowan *et al.*, 2008), and divorce and separation (Fatoye *et al.*, 2004; Lovisi *et al.*, 2005; Adewuya *et al.*, 2007). Other assessed partner relationship measures were not associated with antenatal depression, though attenuation in the strength of univariate associations suggests some confounding with reported frequency of partner's use of alcohol, extent of practical help during the current pregnancy, current partner's fidelity and involvement in decisions related to household expenditures for health care. The lack of distress associated with perceived partner infidelity was difficult to explain. Partner fidelity concerns may have been under-reported, as women's questioning of a partner's fidelity in the study area is often discouraged (Lary *et al.*, 2004). In addition, barriers to expressing and addressing partner fidelity concerns may normalize infidelity, and its expectation may minimize intensity of expected distress.

Finally, associations between early booking for antenatal care and depressive morbidity suggest pregnant and depressed women access allopathic services earlier, than non-depressed counterparts do. This reflects observations from the formative phase that showed in the cultural context symptoms equivalent to depressive morbidity were not perceived as distinct from other physical health and social concerns (Kaaya *et al.*, 2010). The fact participants reported symptoms to health care providers has important clinical implications for opportunities to improve recognition of depression.

Strengths of this study were in utility of economic status and quality of partner relationship measures developed from a formative study. There are however some study limitations. Antenatal depressive episodes reportedly have a similar insidious onset and course as depression occurring in other periods of the life cycle. The study design did not allow for determination of duration since onset of assessed depressive symptoms, hence biases in recall of observed psychosocial risk factors are difficult to determine as existing depressive morbidity may selectively emphasize negative aspects of experiences. Assessment of depressive morbidity relied on a symptom-screening instrument. While a locally adapted, validated and calibrated tool to screen for depression in pregnancy can serve as a proxy measure of depressive disorder, prudence in interpreting the rates is advised as symptom screening tools overestimate depression rates (Bennet *et al.*, 2004). Despite these limitations, the study provides hitherto little known information in the country that allows for some conclusions and recommendations for clinical practice.

The study findings provide support to earlier observations of high prevalence of depressive symptomatology equivalent to major depression during late pregnancy. Furthermore, when assessing pregnant women in this context, a history of previous depressive episodes or low satisfaction with ability to access basic needs, conflict in partner

relationships and relatively earlier booking for antenatal care should alert practitioners to the possibility of depressive morbidity. Findings support a recommendation that antenatal services consider integrating screening for depression in routine antenatal care.

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