



# Mental Wellbeing and Self-reported Symptoms of Reproductive Tract Infections among Girls: Findings from a Cross-sectional Study in an Indian Slum

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## Abstract

*This study examined the self-reported mental wellbeing among slum-dwelling adolescents in Western India and asked whether adolescent postmenarcheal girls' mental wellbeing and self-reported symptoms suggestive of reproductive tract infections (RTIs) were associated. A sub-section of a cross-sectional personal interview survey among unmarried 10–18-year-old adolescents (n= 85) in a slum in the city of Nashik was analyzed. Logistic regression models were used to assess the associations between socio-demographic variables, physical health indicators, and adolescent postmenarcheal girls' mental wellbeing. Nearly every other postmenarcheal girl reported having experienced symptoms suggestive of RTIs during the last twelve months. Adolescent postmenarcheal girls' mental health and some aspects of somatic health appear to be closely interrelated. Understanding the relationship between adolescent mental wellbeing and reproductive health in low-income countries requires further investigation. Health service development in growing informal urban agglomerations in India and beyond should provide combined mental and reproductive health services for adolescents.*

**Keywords:** adolescents, India, mental wellbeing, reproductive tract infections, slums

## Introduction

Research on the linkage between women's various reproductive and mental health conditions has shown that reproductive health problems pose particular strain on mental wellbeing (Astbury et al. 2009; WHO 2009). Rates of depression in women of reproductive age are expected to increase in developing countries and the role reproductive health issues play in this trend requires further understanding (Astbury et al. 2009). The reproductive mental health situation of the unmarried and the adolescents in low-income settings, such as urban informal settlements in India, remains particularly poorly understood (Astbury et al. 2009; WHO 2009).

Lack of youth-friendly sexual and reproductive health services together with the socio-cultural stigma of premarital sexuality can potentially deepen the inter-linkages between reproductive health problems and poor mental wellbeing among unmarried adolescents. In societies with stark gender asymmetry in sexual autonomy, sexual and reproductive health problems can act as particularly powerful stressors (Das et al. 2001).

Reproductive health hazards are a part of the challenges faced by adolescents in slums and is aggravated by the starkly asymmetrical gender relations prevalent in much of South Asia. Menstrual and other gynaecological problems are reported as being a principal health concern by adolescent slum-dwelling girls in India (Joseph et al. 1997; Mmari et al. 2014). Reproductive Tract Infections (RTIs) pose a major sexual and reproductive health problem among adolescents, irrespective of their sexual activity. Some RTIs are sexually transmitted, but environmental conditions, poor general health status and poor personal hygiene can also lead to RTIs (Whittaker 2002). Associations between some issues related to sexual and reproductive health (e.g. vaginal discharge, bacterial vaginosis, thrush, sexual abuse) and mental health among Indian adolescents (Patel and Andrew 2001) and among adults (Manderson and Warren 2009; Patel et al. 2006; Prasad et al. 2003) have been studied. A study by Patel et al. (2006) describes the association of two key determinants of women's health in developing countries, gender disadvantage and reproductive health, with the prevalence of common mental disorders among women in a general population in India.

Epidemiological studies of adolescent mental health in third world slums are few (Fatori et al. 2013). Variables reported to be associated with mental health disorders or symptoms in slum conditions are low level of education, unemployment, and large family size (Silvanus and Subramanian 2012); male gender, lower socioeconomic status, large family, being first-born, having low birth weight, and body mass index (BMI) less than 18.5 (Rahi et al. 2005). In a study by Ram et al. (2014), family violence and restrictions to independence were associated with mental health problems. Physical punishment and maternal anxiety/depression are among other important factors associated with mental health in slum conditions (Fatori et al. 2013).

This article aims to enhance the understanding of the association between adolescent mental wellbeing and reproductive health in challenging slum environments in India. On the basis of earlier studies, the association between mental wellbeing and the following variables are also assessed.

- socioeconomic status: currently studying or not; education level of parents; living in a household below poverty line,
- physical health: reported symptoms of RTIs; stunting; prehypertension,
- parental support: able to speak to parents, and
- level of maturation: menarche within the previous 12 months or earlier.

The symptoms of mental health problems (or the absence of them) have been used as proxy to mental wellbeing.

## Methods

The data used for this substudy were derived from a cross-sectional observational study conducted in two randomly selected slums (one on the outskirts and one inner-city) of Nashik, Maharashtra, India during November 2010–April 2011. Nashik is a city of 1.5 million inhabitants in the western Indian state of Maharashtra. One hundred fifty-six households from the inner-city slum and one hundred twenty households from the outskirt-city slum participated in the study. The total of five hundred forty-five adolescents, population aged 10–19 years, were included in the study.

Prior to the data collection, informed written consent was secured from the study subjects and their parents/guardians. They were also given a written guarantee of confidentiality by the first author. The survey data were collected by trained surveyors who interviewed the study subjects according to the structured questionnaires. The interviews were conducted in a quiet room to ensure privacy. Because the study included subjects below 18-year of age, a parent or guardian were allowed to be present, if the subject desired so. The data included sociodemographic indicators, health-related problems such as mental wellbeing, symptoms of RTI, blood pressure, and general health status, and anthropometric measurements. Data on symptoms suggestive of reproductive tract infections were collected only from postmenarcheal girls. The field study was approved by the Institutional Review Board of Tampere School of Health Sciences in 2010 and it was conducted in accordance with the ethical guidelines in the Helsinki Declaration of 1975, as revised in 2000. We refer to Khopkar et al. (2014) for further details about the study.

The mean age at menarche, 13.7 years, in the slums studied was relatively high compared to those reported in other Indian studies, mean age ranged between 12.5 to 13.6 years, (Khopkar et al. 2015a). In the present study, the analysis was restricted to the girls from the inner-city slum who had attained menarche at the time of the survey. Limiting the substudy to only the inner-city slum helped to control the effect of the living environment and the potentially different exposure to reproductive health experience and information. Of one hundred forty-eight postmenarcheal girls, nearly 38% refused to answer questions related to the reproductive health. A total of 85 postmenarcheal girls had complete data on the reproductive health and mental wellbeing were included

in the present analysis. Multivariate analysis had been carried out to examine the association between mental wellbeing and symptoms of RTI in the presence of other potential variables.

The number of postmenarcheal girls per household was one, two or three in 61%, 36% and 3% households, respectively. The sample size did not allow the use of mixed effects models to control for clustering.

## Mental wellbeing

Mental wellbeing was examined as the dependent variable. The survey questionnaire included questions from the General Health Questionnaire (GHQ-12; Goldberg 1978) and Beck Depression Inventory II (Beck et al. 1961). Combining questions from the two instruments instead of using a standard instrument was considered necessary due to the wide age range of the respondents (10 to 18 years) in the Indian context (Khopkar et al. 2015b).

This study did not aim at determining the prevalence of mental health problems in the study population nor in comparison with other adolescent populations; consequently, using a modified instrument and a measure based on that, was considered justified (for similarly constructed measures of adolescent mental health, see e.g. Fløtnes et al. 2011). Since the set of questions used in this study were derived from two instruments, Cronbach's alpha was calculated to assess internal consistency. The estimate obtained for the instrument used in this study ( $\alpha = 0.74$ ) was comparable to the original GHQ-12 questionnaire.

The twelve questions related to mental wellbeing included the topics of being worried, feeling of helplessness, level of pessimism, perception of personal failure, feeling of worthlessness, disappointment, loss of interest in other people, ability to make decisions, satisfaction with one's appearance, sleeping pattern, feeling fatigued, and appetite. Thus the questions concentrated on symptoms related to potential depression and anxiety, self-esteem, stress, and coping. Each item response was a 4-point scoring system ranging from *better than normal option*, a *same as usual* and a *worse than usual* to a *much worse than usual* option. The responses were coded into two categories: 1 (*better than normal option*) and 0 (other options), and all twelve answers were added up to derive a total score. The total score ranged from 0 to 12; the higher the score, the better the mental wellbeing. The mental wellbeing score was categorised into two groups here according to the mean score: low (0–8) and high (9–12).

## Independent variables

*Symptoms of RTIs:* If a girl reported having experienced any of the symptoms, white discharge, itching in genital area, leakage of urine, increased frequency of urinating,

burning sensation while urinating, during the previous 12 months, she was considered as having suffered or suffering from symptoms suggestive of RTIs.

*Level of maturation:* Menarche is a key indicator of sexual maturation among girls and marks transition from childhood to adolescence (Bosch 2005). It is commonly associated with misconceptions, malpractices and health challenges among girls in developing countries (Bosch 2005; Benjet and Hernandez-Guzman 2001; Savanthe and Nanjundappa 2016). The physiological, mental and social effects of menarche are partly abrupt and partly start to influence a girl's health status gradually (Apter 1980). Here we divided girls into two categories according to the level of maturation: 0 = menarche within the previous 12 months and, 1 = menarche more than 12 months from the survey.

*Studying:* A question "Are you currently studying?" was used to derive the current status of attending school or studying. Study status was regarded as an important socioeconomic marker.

*Able to speak to parents:* Parental support is shown to be an important determinant of mental wellbeing also in slum conditions (Fatori et al. 2013). The relationship was examined by the question "Can you talk to your parents about things that concern you?" The answers were categorised as those who answered "always" or "often", and those who gave other answers. Able to speak to parents is considered as positive parental support.

*Measures of physical health:* Two measures of physical health were used here. Physical appearance might affect the mental wellbeing and stunting was one of the indicators of physical appearance. Stunting was defined using a standard Indian reference population (Khopkar et al. 2014). Studies have shown that symptoms of depression are linked to hypertension and the development of hypertension. The relationship has been established in younger and older adults (Grimsrud et al. 2009; Taylor et al. 2008, Rutledge and Hogan 2002; Yan et al. 2003; Reiff et al. 2001). A negative association between prehypertension and the mental wellbeing was observed in the study subjects (Khopkar et al. 2015b). In that, prehypertension was defined using blood pressure percentiles for given sex, age (between 10 and 17 years) and height as described by National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents (2004). For 18-year-old subjects, the standard definition of hypertension for adults was used.

*Parental education and household income:* Socioeconomic status is among the most evident variables reflected in health, also mental wellbeing (Bosch 2005). Socioeconomic gradient was determined by maternal- and paternal education and per capita household income; the Indian state-specific poverty line was used as a cut-off point (Government of India 2012). Level of education was categorised into those who had

no education or a maximum of 5 years of primary education, and those who were more educated. Mother's and father's education levels were considered as separate variables.

## Statistical analysis

The mean, the standard deviation and percentiles of mental wellbeing score were computed. The independent variables were summarised by estimating the proportions of high mental wellbeing score and corresponding confidence intervals for each category of the independent variables.

The variables which showed differences in the proportions of high mental wellbeing scores were analysed using a logistic regression model. The log-odds of high versus low mental wellbeing scores were modelled as a linear function of these variables. The predictive probabilities for a postmenarcheal girl of high score given specific values of the independent variables were calculated.

The 10% level of significance (or 90% confidence coefficient) was used. This was considered acceptable in the present context since the consequences of being wrong in null hypothesis in this case were minor and the purpose of the analysis was exploratory. We are supporting a move of the statistics community to use the 10% level rather than 5% since the latter has become a standard level without having any authoritative reference to support it.

All analyses were performed using the statistical computing environment R and regression analysis was performed using the glm function of stats package (R Core Team 2013).

## Results

Data on mental wellbeing score and symptoms of RTIs were available for 85 girls in the inner-city slum. The mean and standard deviation of the mental wellbeing score (scale 0 to 12) were 8 and 3. The (10, 25, 50, 75, 90) percentiles were (4, 5, 10, 11, 12). For the association study, each postmenarcheal girl in the inner-city slum was classified as having low (score 0 to 8) or high (score 9 to 12) score. 36 girls had low scores while 49 had high scores. The age distribution was similar between these two categories.

Descriptive summary of the variables in the analysis could be derived from Table 1. The proportion of girls with menarche more than 12 months from the survey was 53%. The level of maturation gave an indication of potentially being related to worsening mental wellbeing score. The difference was not significant. The prevalence of stunting was 8% and it was more probable for stunted girls to have lower mental wellbeing score. One in four girls was prehypertensive.

**Table 1.** Number and proportions (90% confidence interval) of girls with high mental wellbeing score according to the categories of variables. (Data on mental wellbeing score were available for 85 postmenarcheal girls.)

Variables	Categories	Number of observations (%)	Proportion with high mental wellbeing score (90% CI)
Symptoms of RTIs	no	45(53)	0.71 (0.62,0.80)
	yes	39(46)	0.41 (0.31,0.51)
	missing	01(1)	
Level of maturation	menarche within the previous 12 months from the survey	40(47)	0.60 (0.50,0.70)
	menarche more than 12 months from the survey	45(53)	0.53 (0.44,0.63)
Studying now	yes	73(86)	0.56 (0.49,0.64)
	no	11(13)	0.64 (0.45,0.82)
	missing	01(1)	
Stunting	not stunted	71(84)	0.61 (0.53,0.68)
	stunted	06(7)	0.17 (0.00,0.36)
	missing	08(9)	
Hypertension	prehypertensive	20 (24)	0.60 (0.46,0.74)
	normotensive	57(67)	0.56 (0.48,0.65)
	missing	08(9)	
Able to speak to parents	no	12(14)	0.58 (0.40,0.77)
	yes (always or often)	73(86)	0.56 (0.49,0.64)
Mother's education	primary or no	33(39)	0.58 (0.47,0.69)
	secondary or higher	52(61)	0.56 (0.47,0.65)
Father's education	primary or no	11(13)	0.55 (0.35,0.74)
	secondary or higher	72(85)	0.56 (0.48,0.63)
	missing	02(2)	
Below poverty line	no	36(42)	0.67 (0.57,0.77)
	yes	49(58)	0.49 (0.4,0.58)

The proportions having high mental wellbeing score showed clear difference between the categories of the following variables: symptoms of RTIs, level of maturation, stunting, and below poverty line. These selected variables were included in the logistic regression model.

Table 2 showed the results of the logistic regression using four variables and presented the odds ratios among postmenarcheal girls, comparing different categories of the variables having high mental wellbeing score versus low mental wellbeing score. The two most evident variables lowering the odds for having high mental wellbeing were “being stunted” (OR 0.14, CI 0.01–0.86) and “reporting symptoms suggestive of reproductive tract infections” (OR 0.35, CI 0.15–0.79). Level of maturation and living in a household below poverty line also seemed to lower the odds for good mental wellbeing. However, the confidence intervals were quite wide; these differences were not significant.

**Table 2.** Logistic regression: log-odds of high versus low mental wellbeing score is modelled as a linear function of four covariates. Odds ratios and their 90% confidence intervals are given.

Variable	Odds ratio	90% confidence interval
Intercept	3.81	(1.67, 9.55)
Symptoms of reproductive tract infections	0.35	(0.15, 0.79)
Menarche more than one year before survey	0.73	(0.31, 1.70)
Stunted	0.14	(0.01, 0.86)
Below poverty line	0.69	(0.29, 1.62)

Reported symptoms of RTIs reduced the predictive probability of having good mental wellbeing both among stunted and non-stunted girls (Table 3). The predictive probability of high mental wellbeing score was the highest for a girl who was not stunted and had no symptoms suggestive of RTI, and was the lowest for a girl who was stunted and had symptoms of RTI.

**Table 3.** Predictive probabilities for a postmenarcheal girl, with menarche more than one year before the survey and not below poverty line, of high mental wellbeing score for stunted and not stunted and those expressing symptoms of RTIs and those not expressing such symptoms.

		Stunting	
		not stunted	stunted
Symptoms of RTI	no	0.74	0.28
	yes	0.49	0.12

## Discussion

Poor adolescent mental health has been reported to be associated with poor educational achievement, unemployment, substance use, child abuse, domestic violence, and poor quality of parenting (Reiss 2013; Patel et al. 2007). In this study of postmenarcheal adolescent girls living in slum conditions, we found evidence of an association between poor mental wellbeing and having symptoms of RTIs and being stunted. Also level of maturation and living in a household below poverty line seemed to lower odds for good mental wellbeing; however, the confidence intervals were quite wide. The girl's studying status or the parents' education levels, hypertension, or parental relation did not bring forward an association in a logistic regression. The absence of association between parents' education level and their daughter's mental wellbeing may reflect the fact that in the slums, the parental education is uniformly quite low, making it difficult to detect differences in a small sample. Poverty and stunting are both related to poor socioeconomic status and bring forward the close interaction between material wellbeing, somatic health and mental wellbeing also in slum environments.

Nearly every other postmenarcheal girl in the slum sample expressed having had at least one symptom suggestive of RTIs during the previous 12 months. In Sabarwal and Santhya's (2012) sub-nationally representative study in India, 13% of unmarried adolescents had had symptoms during the preceding three months. In small-scale studies 40%–57% of Indian women of reproductive age have reported RTI symptoms (Sabarwal and Santhya 2012). Even when taking into account differences in reporting periods and populations, the prevalence of reported symptoms suggestive of RTIs (46%) in this study was relatively high by Indian standards. The relatively high prevalence of symptoms suggestive of RTIs may be related to the poor living conditions in slum environments such as limited access to water and sanitation, small spaces within the households and risks related to unsafe physical and social environments.

Prehypertension did not seem to be associated with differences in mental wellbeing score. The response to whether able to speak to parents, which was used as an indicator of parental support, did not reflect in the mental wellbeing score. Of the socioeconomic variables such as mother's education, father's education and whether below poverty line, only living below poverty line gave an indication of being related to lower mental wellbeing. Symptoms of reproductive tract infections and mental health remained associated after adjusting for differences in the other variables such as living below poverty line.

The two variables strongly associated with poorer mental health were stunting and reported symptoms suggestive of RTIs. The interrelation between mental health and reproductive health among South Asian adolescents has rarely been empirically studied, apart from those who are sexually or physically abused (Patel and Andrew 2001). Those having poor mental wellbeing can end up in behavioural patterns that lead to poorer reproductive health (Patel et al. 2006). Sociocultural norms in India expect unmarried girls and women to be sexually inexperienced and ignorant. In case they face any sexual or reproductive health problems, it is difficult for them to reveal the situation to family

members, friends or health-care service providers, which rarely meet the requirements of confidentiality (Mmari et al. 2014). South Asian adolescent girls' mental wellbeing is potentially jeopardised by the unhappy combination of vulnerable reproductive health (Bhatia and Cleland 1995), lack of personal autonomy (Ram et al. 2014), and social taboos of seeking treatment (Koenig et al. 1998). To reduce the stark gender asymmetry in sexual autonomy and to empower adolescent girls, they must be educated and financially supported in day-to-day life.

## Limitations

The small study sample stresses the need to interpret results cautiously. As the survey question on the symptoms suggestive of RTIs was posed only to postmenarcheal girls, the option of including all adolescent girls in the study sample was ruled out. This was due to cultural inappropriateness which would have resulted in unreliable data.

The instrument used for measuring mental wellbeing does not provide an opportunity to compare the prevalence of poor mental wellbeing to other populations; however, the modified instrument is accurate to evaluate differences in mental wellbeing within the study population.

This study derives from self-reported symptoms of RTIs and not from bacteriological sampling. Self-report is found to be an inaccurate basis for determining the prevalence of gynaecological morbidity among adult women in India (Bhatia and Cleland 1995; Koenig et al. 1998; Patel et al. 2006). Gynaecological complaints can be somatic idioms for common mental disorders (Whittaker 2002). It is necessary to take this into consideration when interpreting the study results.

The association between symptoms suggestive of RTIs and poorer mental wellbeing in this study sample cannot be directly interpreted as a sign of a causal relationship – reproductive health problems causing poor mental health – although such a causal relationship can exist. Those having poor mental wellbeing can possibly report reproductive health symptoms as an idiom of mental distress, or end up in behavioural patterns that lead to a poorer reproductive health condition. Relatively high rejection (38%) to answer the questions on reproductive health might cause potential bias.

The GHQ-12 and BDI-II are well validated instruments. However, they do not give any information of potential symptoms of behavioural disorders. This is a limitation of the study, as the behavioural disorders could be connected to reproductive health behaviour of the participants.

## Conclusions

This is the first empirical study to point to the interrelationship between mental well-being and symptoms of RTIs among unmarried, underprivileged Indian adolescent girls. The results stress the necessity to take this association into account when planning ways to improve and secure young people's health status in developing countries. The proportion of young people among global population is growing and reproductive and mental health issues will be among the most important health concerns to tackle by national and international health initiatives.

Health services development in growing informal urban agglomerations in India should provide integrated mental health, reproductive health and other health services, including health promotion to adolescents. The importance of a holistic approach to health should be acknowledged; those adolescents who suffer from stunting and live in households below poverty line are most vulnerable also to poor mental wellbeing. Securing employment and proper income for the underprivileged will also lead to lesser anxiety and depression among adolescents. What is needed is adolescent-friendly health care, instruction on child nutrition to reduce stunting, and better food security for the poor. Youth centres and community centres should have the facility to provide education and counselling by professionals on a culturally sensitive topic of sexual and reproductive health, including contraception knowledge and use, for girls and boys as well as parents.

Adolescent postmenarcheal girls' mental health and some aspects of somatic health appear to be closely interrelated in slum conditions. Understanding the relationship between adolescent mental wellbeing and reproductive health in low-income countries requires further investigation using mixed methods, which combines both quantitative as well as qualitative approaches (Tashakkori and Creswell 2007), as reproductive health symptoms can also be cultural idioms of mental ill-being. Bacteriological, epidemiological, and sociocultural studies will be necessary to understand why and how reproductive health and mental health are interrelated in non-western contexts. On the basis of the results of this small exploratory study, researchers would be able to plan a confirmatory study without worrying too much about the false alarms.

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