Mental Health Problems of Iranian Female Adolescents and Its Association with Pubertal Development: A Nationwide Study

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Abstract- Mental health problems including emotional and behavioral problems during puberty may be under influence of different risk factors including cultures, living in urban or rural areas and ethnic factors which may vary between different countries. The main aim of this study is to investigate the profile of emotional and behavioral problems and the role of factors such as age, stage of puberty, ethnicity, rurality and living in urban area, as risk factors in Iranian girls. As a part of a large national study we evaluated the emotional and behavioral problems in different stages of puberty in a community sample of Iranian adolescent girls from public schools that were selected by clustered random sampling method. In all subjects, demographic characteristics, and pubertal stages were measured. Emotional and behavioral problems were evaluated using Strength and Difficulties Questionnaire (SDQ). The associations of age, pubertal development indices, socioeconomic and demographic factors with the behavioral problems were assessed. A total number of 4576 students enrolled the study and responded to the questions. The mean age of participants was 13.83±2.19 years. The mean total score of difficulties in participants was 14.34±5.81. According to these results 813 (17.8%) adolescents had total problem scores higher than Goodman's cutoff points and the most frequent problem domain was conduct problems (20.5%). According to the results the most related variable with the total difficulty score of SDQ were ethnicity, residency in urban areas and development of menstrual cycle respectively. The results of this study showed that the most correlated factors with mental health problems in Iranian girls during puberty are ethnicity, urbanity and development of menstrual cycle.

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Keywords: Mental health; Adolescents; Puberty; Girls; Behavioral problems

Introduction

Development of adolescents is normally associated with transient mental health problems including emotional and behavioral difficulties and adjustment problems (1). However the definition of mental health problems is difficult and includes a wide range of problems which are classified as internalizing and externalizing (2). According to the recent studies adolescence period in girls is associated with increment in the rate of internalizing problems including depressive disorders accompanied by suicidal attempts and externalizing problems such as delinquent behavior and attention deficit/hyperactivity disorder. This simultaneous increment of internalizing and externalizing problems suggest the role of gender and age as important risk

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factors (3). However many other risk factors have been suggested which can increase behavioral problems. Menarche is one of the most important factors associated with the high rate of maladjustment internalizing behaviors. Other factors include age at the menarche, adverse life events, lone mothers and divorce (3). Recent studies have shown that the internalizing and externalizing problems are higher in girls who experience early puberty in comparison to those experiencing late puberty (4-6). Adolescents in single parent families are at a greater risk for emotional problems especially major depressive disorder than the intact families (3). According to the study of Capron *et al.,* during prepubertal period menarche status is an important risk factor for emotional and behavioral problems independent of family structure (3). Another study showed that self report depression is associated with early puberty and early onset puberty is an important risk factor for mental health problems (7). Biological changes during puberty have a social value; it means that the adjustment with the challenge of body change and expected role is associated with consequent mental problems and negative outcomes. Therefore from both social and psychological points of view, out of time puberty is a risk factor for emotional and behavioral problems (4). Emotional and behavioral problems during puberty may be under influence of other factors including cultures, living in urban or rural areas and ethnic factors which may vary between different countries. In this study we investigated the profile of emotional and behavioral problems and the role of factors such as age, stage of puberty, ethnicity, rurality and living in urban area, as risk factors in Iranian girls.

Materials and Methods

Study subjects

As a part of a large national study we evaluated the emotional and behavioral problems in different stages of puberty in a community sample of Iranian adolescent girls from public schools that were selected by clustered random sampling method. The original study was a cross-sectional study and a total number of 7,493 normal Iranian girls aged 6 to 20 years of 30 clusters were included to assess their pubertal development. Pubertal stages were assessed according to Tanner's criteria. Reference curves for different breast stages and menarche were constructed. In this study the adolescent girls at the ages 10 to 20 were selected from the original sample and evaluated for emotional and behavioral difficulties. The study protocol was approved by the Ethics Committee of the Ministry of Health and the School Boards. The girls at the age of 10–20 years from urban and rural areas of total states of Iran were selected. Adolescents with acute or chronic diseases were excluded. In all subjects, demographic characteristics, and pubertal stages were measured by the same team of investigators.

Procedure

Team members were trained in a workshop by multidiscipline professionals consist of pediatrics, pediatric endocrinologist, child and adolescent psychiatrist. After describing the objectives of the study to the students and the parents and obtaining consent by the study team members, at the first stage of the study the pubertal indices and pubertal stages were determined by visual inspection and palpation, using the criteria and definitions described by Marshall and Tanner; i.e. breast stages 1–5 by both inspection and palpation; breast stage B2 corresponds to the breast bud stage with palpable glandular breast tissue and elevation of the papilla, stage B3 with further enlargement of the breast and areola with no separation of the contours, stage B4 where the areola and papilla form a secondary mound above the level of the breast, and stage B5 was assigned in case of the mature breast with projection of the papilla only. The onset of puberty is measured as the age at breast development at Tanner stage 2 (B2). Pubic hair stages (PH1–PH5) were also evaluated; stage PH2 being assigned with the presence of long, slightly pigmented hair (straight or curled). The children were grouped by 1-year age intervals, which extended from the day of the child's birthday to the day before the next birthday.

At the second stage, after description of Strength and Difficulty Questionnaire to the students and how to complete it by a team member, the students were answered to the total questions themselves.

Strength and Difficulty Questionnaire (SDQ) is a structured questionnaire for screening the child and adolescent psychiatry problems including behavioral and emotional difficulties. SDQ asks about 25 attributes which consist of 5 subscales including emotional, hyperactivity, peer problems, conduct and prosocial behaviors. Adolescents use 3-point Likert scale to indicate to what extent each item applies. The sum of the first four sub-scales consist the total score of difficulties. The questionnaire has three forms; parent report, teacher report and self report which the Persian version of self report was used in this study. Psychometric properties of SDQ including validity and reliability were determined and confirmed in previous studies (8). Sensitivity and

specificity of SDQ were measured by Goodman *et al.* in a study and were 63.3% and 94.6% respectively. Goodman reported that SDQ is suitable for screening and detection of child psychiatric disorders in child mental health researches (9,10). Psychometric properties of Persian version of SDQ were measured in Iranian population and Farsi version cutoff points were similar to the Goodman's (11). We used Goodman's cutoff point which classifies participants in normal, borderline and abnormal groups but we considered the sum of borderline and normal groups as normal in our study.

Statistical analysis

Descriptive statistics were reported using means and frequency values. We classified the participants according to the adolescent age categories including early adolescents 10-13 years, middle 14 to 16 years and late adolescence17 to 20 years and compared emotional and behavioral problems using Chi-square statistical analysis. The associations of age, pubertal development indices, socioeconomic and demographic factors with the behavioral problems were studies using logistic regression analysis. Statistical analysis was carried out using SPSS 15. All statistical references were made at α=0.05.

Results

Demographic characteristics

A total number of 4576 students responded to the questions from 30 clusters from 8 ethnic groups. The mean age of participants was 13.83 ± 2.19 years.

Table 1 shows demographic characteristics of total participants and also according to early, middle and late adolescence age groups.

Table 1. The frequency of demographic characteristics and their comparison in different age groups.

Characteristics		<14 years n(%)	14-16 years n(%)	>16 years n(%)	χ^2	*P*	Total n(%)
Residency							
	Urban	1493(70.9)	841(67.5)	889(72.6)	8.21	0.016	3223(70.4)
	Rural	613(29.1)	405(32.5)	335(27.4)			1353(29.6)
Ethnicity							
	Fars	1044(52.1)	646(53.5)	618(52.1)			2308(52.5)
	Azari	363(18.1)	190(15.7)	203(17.1)			756(17.2)
	Kord	201(10)	98(8.1)	68(5.7)			367(8.3)
	Arab	18(0.9)	28(2.3)	32(2.7)	47.85	<0.001	78(1.8)
	Torkman	22(1.1)	14(1.2)	17(1.4)			53(1.2)
	Balouch	64(3.2)	32(2.7)	32(2.7)			128(2.9)
	Lor	148(7.4)	83(6.9)	103(8.7)			334(7.6)
	others	144(7.2)	116(9.6)	114(9.6)			374(8.5)
Father job							
	Unemployment	79(3.8)	41(3.3)	29(2.4)			149(3.3)
	Worker	386(18.4)	225(18.3)	161(13.2)			772(17)
	student	2(0.1)	2(0.2)	1(0.1)			5(0.1)
	Employee	520(24.8)	279(22.6)	229(18.7)	109.92	<0.001	1028(22.6)
	Business	777(37.1)	424(34.4)	463(37.9)			1664(36.6)
	Retire	59(2.8)	77(6.3)	101(8.3)			237(5.2)
	Dead	66(3.2)	40(3.2)	73(6.0)			179(3.9)
	others	206(9.8)	144(11.7)	165(13.5)			515(11.3)
Mother job							
	Unemployment	7(0.3)	6(0.5)	1(0.1)			14(0.3)
	House wife	1872(89.7)	1113(90.3)	1121(91.7)			4106(90.4)
	Worker	11(0.5)	5(0.4)	2(0.2)			18(0.4)
	student	7(0.3)	4(0.3)	5(0.4)			16(0.4)
	Employee	126(6.0)	73(5.9)	48(3.9)	33.80	0.006	247(5.4)
	Business	27(1.3)	7(0.6)	16(1.3)			50(1.1)
	Retire	6(0.3)	5(0.4)	8(0.7)			19(0.4)
	Dead	7(0.3)	8(0.6)	15(1.2)			30(0.7)
	others	25(1.2)	11(0.9)	6(0.5)			42(0.9)

Table 2. The comparison of emotional and behavioral problems between adolescents' age categories.

SDQ scores	*Age categories* *%* *n*			λ^2	*P*
	<14 Years	14-16 years	>16 years		
Emotional	17.1	21.8	21.8	16.09	<0.00
	360	272	267		1
Conduct	17.5	25.9	23.4	35.04	<0.00
	350	311	276		1
Hyperactivity	9.1	15.4	12.1	29.79	<0.00
	181	184	144		1
Peer	24.2	20.4	16.3	28.03	<0.00
	480	244	190		1
Prosocial behaviors	96.6	95.9	96.9	1.79	0.408
	1940	1145	1149		
Total	17.4	23.8	20.5	18.05	<0.00
	318	269	226		1

Mental health problems amongst participants

The mean total score of difficulties in participants was 14.34 ± 5.81, and the mean scores for SDQ subscales were 4.36 ± 2.40 and 2.99 ± 1.89 for emotional and conduct, 3.87 ± 2.08 and 3.13 ± 1.75 for hyperactivity and peer problems. The mean score for prosocial behavior was 7.92 ± 1.66. According to these results 813 (17.8%) adolescents had total problem scores higher than Goodman's cutoff points. The most frequent problem domain was conduct problems (20.5%). To assess the effect of adolescent age stages on emotional and behavioral difficulties, we compared SDQ total and subscale scores between early, middle and late adolescence age groups and table 2 shows these results.

The participants were also categorized based on their Marshall and Tanner puberty stages in breast development, pubic hair and development of menstrual cycle at the time of study. We compared emotional and behavioral problems between different puberty stages and table 3 shows these results.

Table 3. The comparison of emotional and behavioral problems in different stages of Tanner puberty indices.

SDQ scores	*Breast Development* *%* *N*					λ^2	*P*	*Pubic hair Development* *%* *n*					λ^2	*P*	*Menses period development* *%* *n*		λ^2	*P*
	1	2	3	4	5			1	2	3	4	5			Yes	No		
Emotional	19.7	19.2	16.9	17.8	21.6	11.59	0.021	22.4	15.1	16.3	20.2	20.6	10.41	0.034	20.6	17.2	6.46	0.011
	26	59	118	204	492			35	47	90	229	497			684	215		
Conduct	14.6	15.0	17.1	20.2	24.5	31.61	<0.001	11.1	15.3	18.0	19.6	24.3	33.13	<0.001	23.6	15.6	32.94	<0.001
	18	43	114	221	537			16	45	93	213	564			752	185		
Hyperactivity	4.1	7.6	9.5	11.5	13.3	19.92	<0.001	6.3	5.2	8.8	10.9	13.7	29.82	<0.001	13.3	7.0	33.59	<0.001
	5	22	63	126	293			9	15	46	118	320			427	82		
Peer	34.4	30.2	22.9	20.3	18.9	35.45	<0.001	32.4	24.8	24.0	21.1	19.3	20.78	<0.001	19.2	26.0	23.81	<0.001
	42	87	151	220	412			47	71	122	228	444			609	304		
Prosocial	97.6	97.6	97.3	96.6	95.9	4.85	0.30	95.1	98.6	98.1	95.9	96.2	10.36	0.035	96	97.8	8.49	0.003
behaviors	120	284	644	1061	2113			135	287	512	1046	2241			3073	1157		
Total	19.6	16.8	15.4	20.0	21.9	14.40	0.006	18.1	13.6	16.6	20.7	21.4	13.02	0.011	21.5	16	14.97	<0.001
	21	44	94	200	454			23	35	77	209	468			642	171		

The correlations

The correlation between age stages, pubertal indices and demographic characteristics with emotional and behavioral problems were assessed using enter method of logistic regression for each dependent and independent variable separately. According to these results middle and late adolescent categories of age, residency in rural area, father unemployment and some of the ethnic groups were more correlated to higher difficulties. Between puberty indices just menses period development show strong correlation with higher emotional and behavioral difficulties and the other indices showed few or no correlation with the difficulties. To investigate the most related factors for emotional and behavioral problems we selected the most correlated independent variables and then we compared them using logistic regression considering all independent correlated variables concomitantly.

Indicator for ordinal variables was the first variable and we considered rural residency, unemployment and Fars ethnic group as main indicators for residency status, father job and ethnicity respectively. Accordingly the most related variable with the total difficulty score of SDQ were Balouch ethnic group (P<0.001, B=0.842, Odds ratio=2.321, 95% CI: 1.492-3.609), residency in urban areas (P<0.001, B=0.533, Odds ratio=1.704, 95% CI: 1.373-2.116), menses period development (P=0.003, B=.358, Odds ratio=1.430, 95% CI: 1.126-1.815) respectively. For prosocial behaviors which are a positive behavioral factor, menses period development showed the most correlations (P=0.039, B=0.621, Odds ratio=1.860, 95% CI: 1.031-3.357). Table 4 and table 5, show the associations between more related variables with other SDQ subscales.

Table 4. The association of predictive variables with the emotional and behavioral problems.

Variables	*Emotional problems*				*Conduct problems*			
	Beta	***P***	**Odds Ratio**	**CI 95%**	**Beta**	***P***	**Odds Ratio**	**CI 95%**
Age categories								
<14	-	0.069	-	-	-	0.024	-	-
14-16	0.235	0.032	1.266	1.021-1.567	0.293	0.006	1.340	1.086-1.654
>16	0.220	0.050	1.246	1.000-1.552	0.165	0.136	1.180	0.949-1.467
Menses development	0.102	0.367	1.107	0.887-1.381	0.450	<0.001	1.569	1.249-1.971
Residency	0.407	<0.001	1.502	1.231-1.833	0.426	<0.001	1.531	1.252-1.873
Father job								
Unemployment	-	0.007	-	-	-	0.082	-	-
Student	-20.844	0.999	0	0	-0.671	0.563	0.511	0.052-4.978
Employee	-0.666	0.001	0.514	0.345-0.766	-0.383	0.075	0.682	0.447-1.040
Worker	-0.496	0.017	0.609	0.406-0.914	-0.158	0.468	0.854	0.557-1.309
Retired	-0.973	<0.001	0.378	0.225-0.634	-0.740	0.006	0.477	0.282-0.807
Business	-0.466	0.018	0.627	0.427-0.922	-0.236	0.259	0.790	0.524-1.189
Others	-0.349	0.111	0.706	0.459-1.084	-0.314	0.181	0.731	0.461-1.157
Dead	-0.355	0.171	0.701	0.422-1.165	-0.356	0.203	0.701	0.405-1.212
Ethnicity								
Fars	-	0.003	-	-	-	0.003	-	-
Azari	0.123	0.252	1.130	0.917-1.394	0.195	0.062	1.216	0.990-1.493
Kord	-0.258	0.094	0.773	0.572-1.044	-0.224	0.148	0.799	0.590-1.083
Arab	0.621	0.013	1.861	1.141-3.035	0.530	0.035	1.699	1.038-2.780
Torkman	0.377	0.239	1.458	0.778-2.734	0.242	0.464	1.274	0.666-2.439
Balouch	0.640	0.002	1.897	1.261-2.853	0.237	0.311	1.268	0.801-2.006
Lor	0.100	0.538	1.105	0.804-1.520	0.370	0.020	1.448	1.061-1.975
Others	0.054	0.721	1.056	0.785-1.419	-0.255	0.116	0.775	0.563-1.065

Table 5. The association of predictive variables with the emotional and behavioral problems (continue).

Variables	*Hyperactivity problems*				*Peer problems*			
	Beta	***P***	**Odds Ratio**	**CI 95%**	**Beta**	***P***	**Odds Ratio**	**CI 95%**
Age categories								
<14	-	0.042	-	-	-	0.002	-	-
14-16	0.289	0.032	1.335	1.025-1.739	-0.13	0.218	0.875	0.708-1.082
>16	0.030	0.831	1.031	0.780-1.361	-0.40	0.001	0.668	0.532-0.839
Menses development	0.666	<0.001	1.947	1.430-2.652	-0.19	0.064	0.823	0.670-1.011
Residency	0.729	<0.001	2.074	1.570-2.740	0.068	0.488	1.071	0.883-1.299
Father job								
Unemployment	-	0.018	-	-	-	0.002	-	-
Student	-20.19	0.999	0	0	-0.08	0.931	0.920	0.139-6.068
Employee	-0.784	0.002	0.457	0.279-0.749	-0.69	0.001	0.502	0.339-0.743
Worker	-0.427	0.095	0.653	0.396-1.076	-0.47	0.019	0.625	0.421-0.927
Retired	-1.075	0.001	0.341	0.181-0.644	-0.80	0.002	0.447	0.269-0.742
Business	-0.688	0.005	0.503	0.312-0.810	-0.76	<0.001	0.469	0.321-0.686
Others	-0.667	0.021	0.513	0.291-0.905	-0.61	0.004	0.543	0.356-0.827
Dead	-0.500	0.125	0.607	0.321-1.148	-0.33	0.196	0.716	0.432-1.188
Ethnicity								
Fars	-	0.268	-	-	-	0.004	-	-
Azari	-0.035	0.797	0.965	0.737-1.264	-0.08	0.497	0.927	0.745-1.153
Kord	-0.342	0.089	0.711	0.479-1.054	-0.27	0.080	0.764	0.565-1.033
Arab	0.217	0.493	1.243	0.668-2.311	0.006	0.984	1.006	0.551-1.838
Torkman	-0.080	0.858	0.923	0.383-2.222	0.198	0.559	1.219	0.628-2.367
Balouch	0.257	0.372	1.292	0.736-2.270	0.685	0.001	1.984	1.325-2.970
Lor	-0.238	0.334	0.788	0.487-1.277	0.315	0.038	1.370	1.018-1.843
Others	-0.439	0.050	0.645	0.416-1.001	0.035	0.023	0.624	0.775-1.384

Discussion

This nationwide cross-sectional study is the first one which has investigated the mental health problems in the large representative sample of female adolescents of all Iranian provinces and different ethnic groups in association with pubertal status. This study has also considered the effect of age, ethnicity, urban or rural residency, and parents' jobs as important socio-demographic indices on the emotional and behavioral difficulties during adolescence period. According to these results 17.8 % of participants had total emotional and behavioral problems and conduct problems was the most frequent one. These results somehow support the results of a study in Tehran (the capital of Iran) which show that 15% of female adolescents have total scores higher than Goodman's cutoff points and conduct problems (21.6%) were the most frequent problem (12). Mental health problems were investigated in several studies such as BELLA study in German adolescent population. In comparison to German population, Iranian adolescent reported higher prevalence of mental health problems than Germans' adolescents (10% in female adolescents) (13). Our study also showed that the increment of age is associated with more frequent emotional and behavioral problems and this result is in apposite to the results of three separate studies by Angold *et al.*, Patton and Hayward *et al*. They showed that puberty is more important than age (14). But these three studies have investigated the relationship between puberty stages and age just with depressive symptoms but in our study we considered the all the emotional and behavioral problems and if we consider a wider range of problems, age progression may show stronger association. By using Chi-square statistical analysis, we detected significant differences in emotional and behavioral problems in different stages of Tanner's puberty indices except for the relationship between breast development stages and prosocial behavior. Although emotional, conduct and hyperactivity

problems and the total score increase during the progression of breast development, pubic hear development and menstrual cycle development, peer problems and prosocial behavior show decrement. Logistic regressions showed less correlation for breast and pubic hear development in contrast to menses period which showed stronger association with higher emotional, conduct, hyperactivity, and total problems. Capron *et al*., in a study on 553 adolescent girls, ages 12-13 years showed that menarcheal status and family structure are stronger risk factors for emotional and behavioral problems (3). Our study also supports these results.

The association of other socio-demographic factors with mental health problems was investigated and based on these results; adolescents who live in rural areas have less mental health problems than those living in urban areas, and fathers' unemployment is correlated to more frequent mental health problems. Mental health problems are also more frequent in some ethnic groups. In a study Fagg *et al*., investigated the effect of individual, family and area characteristics on emotional distress in adolescents in East London and reported that ethnicity is strongly correlated with mental health problems. They also showed the association between adolescents' psychological distress and some aspects of social environment at the family level. Factors such as good parent-adolescent relationships and good social support were negatively associated with distress (15). Our findings support this report when consider that living in rural areas is correlated with less emotional and behavioral problems which may depend on to more supportive and intact family structure in rural Iranian populations. In summary; age, menstrual cycle development, residency in urban areas and ethnic groups show stronger correlation with mental health problems, and logistic regression between these correlated factors show that the most correlated factors for emotional problems are ethnicity, urbanity, higher ages and menstrual cycle development respectively. For conduct problems ethnicity, menses period, urbanity and higher ages are more correlated factors. Urbanity, menses period development and higher ages are more correlated with hyperactivity problems. Ethnicity is also more correlated with peer problems. Finally the most correlated factors with the total problems are ethnicity, urbanity and menses period development respectively. Although some of these factors including menses period development, residency in urban area and higher ages especially 14-16 years of age showed more consistent association with mental health problems, the other factors such as ethnicity didn't show persistent correlation with all domains of emotional and behavioral problems.

Limitations

Our results are under influence of some limitations. The first limitation is using self report form of SDQ. Multiple reports including parent, teacher and adolescent reports are more valuable than single reports of behavioral problems. The next limitation is using jobs, rurality and urbanity as indices of socio-demographic and cultural status which are not so specific and we can not detect the most specific socio-demographic relevant factors to the emotional problems.

Other limitation is the type of study which is a cross sectional one which could not detect risk factors as well as longitudinal studies. We propose further researches with more specific socio-demographic and cultural variables and also using longitudinal studies to detect the risk and protective factors. In conclusion, the results of this study showed that the prevalence of mental health problems in Iranian female adolescents is 17.8% and the most correlated factors with mental health problems in them are ethnicity, urbanity and development of menstrual cycle.

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