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Obstetric and psychosocial risk factors for depressive symptoms during pregnancy

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ABSTRACT

We aimed to determine the psychosocial and obstetric correlates of depressive symptomatology during pregnancy in South-Eastern Hungary. A total of 1719 women were screened for depression in four counties in 2006 and 2007, based on a Leverton Questionnaire (LQ) score of ≥ 12 at 14–24 weeks of gestation. The LQ scores indicated a probable depressive illness (PDI) in 17.2% of the study group. The best predictors in a multiple regression analysis were history of major depression (adjusted odds ratio [AOR]=3.23), and major life events (AOR=2.43). A perceived lack of social support from partner (AOR=1.79) and lack of support by family (AOR=1.23) were also significant determinants. Lack of planning of pregnancy (AOR=1.12) and a history of unfavourable obstetric outcome (AOR=1.42) also seem to predispose to PDI. Overall, psychosocial factors appeared important in the prediction of PDI, whereas economic features did not.

1. Introduction

Pregnancy involves major changes in the mother's life in many respects, (e.g. hormonal status, social role, etc.), and the exact correlation between these and depression is of increasing scientific interest (Ross et al., 2004; Halbreich, 2010). There is a growing body of literature about depressive symptoms during pregnancy with most studies using questionnaire measures to detect probable cases with high levels of symptomatology. In a wide-ranging literature review, Lancaster et al. (2010) found that the strongest predictors of depressive symptomatology during pregnancy were maternal anxiety during pregnancy, life stress, past history of depression, lack of social support, experiencing stressful life events in the previous year, lower education, smoking, single marital status, and poor relationship quality. Mothers satisfied with their family life appear more protected from depression during pregnancy (Goyal et al., 2010; Lancaster et al., 2010; Evans et al., 2001). Those with employment problems and on chronically low income are at a greater risk of developing depressive symptoms during pregnancy (Goyal et al., 2010; Lancaster et al., 2010). Unplanned or unwanted pregnancy can likewise be a risk factor (Lancaster et al., 2010), and these are major determinants for depression in the postpartum period as well (Beck, 2001; Leverton and Elliott, 2000a,b; Robertson et al., 2004; Kozinszky et al., 2011). In the Eastern half of Central Europe, mothers have to cope with a different pattern of psychosocial risk factors compared to those described in the existing literature, e.g. increasing poverty rate and a transition in attitudes to returning to work in the postpartum period (Kozinszky et al., 2011).

Roughly 5–15% of women (Chatillon and Even, 2010) are found to suffer with high levels of depressive symptoms during pregnancy at any moment in time, whereas as many as 12.7% of pregnant women experience major depressive disorder at some point during pregnancy (Gaynes et al., 2005; Vesga-López et al., 2008). However the reported prevalence values vary depending on the method used for diagnosis and on whether the data collection was done in a prospective or retrospective manner (Austin, 2003). In community studies, usually, only prevalence estimates based on screening test scores are feasible (Robertson et al., 2004).

Although it is of paramount importance to identify and treat depression during and after pregnancy, especially among women

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at heightened risk, in Central Europe there is a dearth of research on the epidemiology of depression during pregnancy. Identification of the sociocultural factors most relevant to the sufferer's own experience makes it possible for any intervention to be more closely targeted to the individual case (Nahas et al., 1999). To our knowledge, ours is the first study to estimate prevalence rates and to look into the sociodemographic, economic and psychological predictors of probable depression during pregnancy in Central Europe.

1.1. Aims

The main goals of this study were to perform a large-scale survey to (1) estimate the prevalence of depression during pregnancy in South-Eastern Hungary and (2) to examine the influence of sociodemographic, economic, and psychological risk factors on this.

We predicted that several of the sociodemographic variables (e.g. marital status, number of children, etc. (Hungarian Statistical Office, 2007) had an influence on the prevalence of probable depression in the antepartum period, as they did in the postpartum (Kozinszky et al., 2011). It was suggested that the unfavourable economic situation of the average Hungarian family would have a strong influence on depressive symptoms during pregnancy (Kozinszky et al., 2011). The poverty rate in the entire Hungarian population was 14.3% in 2006 (Hungarian Statistical Office, 2008), and in those households where the mother returned to work soon after delivery the poverty rate was less than half of that in households were the mother remained at home (Hungarian Statistical Office, 2008). The mother's wish to return to work soon after delivery and self-reported low financial income had appeared to be linked to higher risk of probable postpartum depression (PPD) in South-Eastern Hungary (Kozinszky et al., 2011), but its association with depression during pregnancy was unknown.

2. Methods

2.1. Participants and procedure

The study was carried out in all the 62 pregnancy-care centres of South-Eastern Hungary between 20th November, 2006 and 31st September, 2007. All women between weeks 12 and 24 of their pregnancy living in the four counties of South-Eastern Hungary were invited into the study.

After an explanation of the objectives of the study and informed consent, a trained health visitor conducted a questionnaire interview, guaranteeing anonymity. Initially, 2117 pregnant mothers were invited to participate in the study, out of whom 286 (13.2%) declined to participate. One hundred and twelve (5.2%) mothers were excluded mainly due to second trimester abortion, and, a smaller proportion of them, due to mourning for a deceased husband or parent, depression due to a general medical condition not related to the pregnancy (e.g. progressive malignant illness) or other acute psychiatric illness diagnosed by a trained psychiatrist, neurological problems, such as epilepsy, or illiteracy, which was very rare. A remaining 1719 pregnant women in the second trimester (between 14 and 24 weeks of gestation) participated in the study.

Leverton and her colleagues created their 24-item questionnaire (LQ) tapping into symptoms of major and minor depression to detect PPD (Elliott et al., 2000). We had previously confirmed that it was a valid scale measurement for screening for depression at a cut-off value of 11/12 (Csatordai et al., 2009).

The interview in this study included the LQ, and additional structured questions (see Appendix) exploring sociodemographic, obstetric, economic, and psychological risk factors. Some questions derived from worldwide findings regarding major risk factors for perinatal depressive symptoms, whereas others were created in an attempt to study the effects of sociodemographic and psychosocial determinants specific to Hungary.

All of these questions were 'yes/no' questions and corresponded to a variable in our analysis, except for the variable of major life events in the past year for which a minimum of two items from a list of ten questions selected from established life events scales (Paykel et al., 1971) was required to be answered positively for the variable to be coded as positive (Robertson et al., 2004): (1) being separated or divorced, (2) serious problems in marriage or cohabiting relationship, (3) serious problems or conflicts with family, friends, or neighbours, (4) problems at work or in place of education, (5) economic problems, (6) serious illness or injury, (7) serious illness or injury in close family, (8) road traffic accident, fire, or theft, (9) loss of a close relative, and (10) other difficulties (Newman and Bland, 1994). As described by several authors, the occurrence of two or more stressful major life events in the previous year is a strong predictor of perinatal depression (Newman and Bland, 1994; Elliott et al., 2000; Robertson et al., 2004; Kozinszky et al., 2011). A history of major depression independent of childbirth or prior postpartum depression has a strong influence on perinatal depression (Elliott et al., 2000; Robertson et al., 2004; Lancaster et al., 2010; Kozinszky et al., 2011), and this too was examined. Health visitors explored any previous history of depression from the patient's account, clinic letters, discharge summaries, and prescription records. Where previous records were not available and the patient reported a history of low mood suggestive of a depressive illness, a psychiatrist also interviewed the patient to establish whether the diagnosis of a past episode was warranted. Self-defined low income and the intention to return to work after the postpartum period (6–12 months after delivery) also appeared of interest based on the previous literature (Leverton and Elliott, 2000a,b; Lancaster et al., 2010; Kozinszky et al., 2011). Emerging evidence suggests that subjective evaluation of one's own economic status is a better predictor of future psychiatric morbidity than unemployment or objectively defined poverty (Weich and Lewis, 1998). Intention to return to work was an important variable, as, although the relevant laws and state provision had not changed, there seemed to be a changing trend in mothers to return to work as early as possible and this had not been examined in previous studies. We further wished to examine associations with different aspects of satisfaction with family life, perceived support by partner and family, relationship quality, and an independent style of management of problems of everyday life (Elliott et al., 2000; Tammentie et al., 2002). We were also interested to study the effect of previous stillbirth, congenital malformations, and spontaneous and induced abortion.

The study protocol and the questionnaire were approved by the Clinical Research Ethics Committee of the University of Szeged (date of approval: 29 November 2005; reference number: 13-3/63/2005). The study was carried out in full accordance with the Declaration of Helsinki.

2.2. Statistical analysis

Computations were carried out with the SPSS 14.0 software (SPSS Inc., Chicago, IL). Most continuous variables did not show normal distribution in our participant groups; therefore, non-parametric tests were used.

The correlations between binary categorical variables were analysed by chi-square tests. To test between group differences, the Kruskal–Wallis analysis of variance was used. Also, multiple logistic regression analysis was applied to assess demographic and psychosocial characteristics of probable depression during pregnancy in a simultaneous fashion. All bivariate analyses were weighted to age and type of residence representative for South-Eastern Hungary (McCulloch and Searle, 2001). Each variable included into the final model was highly significant and the most robust model was chosen (Hosmer and Lemeshow, 1989). Multicollinearity of the variables and linearity of log odds in the final model were also tested.

3. Results

3.1. Participant attributes

The social and demographic circumstances of the participants are presented in Table 1. Out of our 1719 participants, 295 (17.2%) mothers had an LQ score of ≥ 12 (probable depressive illness; PDI). The PDI group was not different in terms of age from the mothers scoring below 12 on the LQ (non-PDI). A higher proportion of those with PDI lived on farms (8.5%) than of those without depression (3.8%) ($p=0.002$). Healthy mothers were more likely to be married or to live in a cohabitant partnership (with no significant difference). A slightly lower educational attainment was observed in the PDI relative to the non-PDI group, and there was practically no difference in the number of children.

A notable difference could be observed in the rates of primiparity between the PDI and non-PDI group, with significantly more primiparous women in the non-PDI group. Previous induced abortion or unfavourable obstetric outcome increased the likelihood of PDI. Mothers with PDI were generally less likely to have sterility or infertility before the actual pregnancy. Importantly, pregnancy planning was a factor highly distinctive between the

Table 1
Selected sociodemographic and obstetric anamnestic data of the study group in 2006 ($N=1719$).

	Mothers with PDI during pregnancy (≥ 12 points in the LQ) ($N=295$)		Non-depressed mothers (<12 points in the LQ) ($N=1424$)		P value[a]	OR (95% CI)[a]
	n	%	n	%		
Age (mean ± SD)[b] (year)	27.73 ± 5.05		27.76 ± 4.28		NS[c]	
Type of residence						
Town	181	61.4	906	63.6	0.002	
Village	89	30.2	464	32.6		
Outlying area	25	8.5	54	3.80		
Married or cohabiting	181	61.4	899	63.1	NS[c]	0.93 (0.72–1.20)
Educational level						
Primary	38	12.9	183	12.9	NS[c]	
Secondary	137	46.4	611	42.9		
High school or university	120	40.7	630	44.2		
Number of children (mean ± SD)[b]	1.75 ± 1.18		1.48 ± 0.83		NS[c]	
Primiparity	151	51.2	848	59.6	0.009	0.71 (0.55–0.92)
Previous abortion	86	29.2	273	19.2	<0.001	1.73 (1.31–2.30)
Previous unfavourable obstetric outcome****	133	45.1	477	33.5	<0.001	1.63 (1.26–2.10)
Previous infertility	31	10.5	242	17.0	0.005	0.57 (0.39–0.85)
Previous sterility	5	1.7	82	5.8	0.002	0.28 (0.11–0.70)
Unplanned pregnancy	92	31.2	315	22.1	0.001	1.60 (1.21–2.10)
Unwanted pregnancy	9	3.1	43	3.0	NS[a]	1.01 (0.49–2.10)

****Previous unfavourable pregnancy outcome: previous spontaneous or induced abortion, stillbirth. Abbreviations: PDI: probable depressive illness; LQ: Leverton questionnaire.

[a] P value, odds ratio and 95% confidence interval of comparison of categorical data with Fisher exact test or chi-square test.

[b] Continuous variables displayed as means ± standard deviation (S.D.).

[c] Statistically not significant.

Table 2
Psychosocial determinants of PDI during pregnancy.

	Mothers with PDI during pregnancy (≥ 12 points in the LQ) ($N=295$)		Non-depressed mothers (<12 points in the LQ) ($N=1424$)		P value[a]	OR (95% CI)[b]
	n	%	n	%		
History of major depression	31	10.5	37	2.6	<0.001	4.6 (2.68–7.22)
Major life events in past year	142	48.1	364	25.6	<0.001	2.7 (2.09–3.5)
Unstable relationship	14	4.7	82	5.8	NS[b]	0.81 (0.46–1.46)
Lack of support by partner	100	33.9	390	27.4	0.028	1.36 (1.04–1.78)
Lack of support by family	90	30.5	341	23.9	0.022	1.39 (1.06–1.84)
Self-reported low financial income	57	19.3	160	11.2	<0.001	1.90 (1.36–2.64)
Intention to return to work after postpartum period	82	27.8	665	46.7	<0.001	0.44 (0.33–0.58)
Independent style of management of problems of everyday life	165	55.9	755	53.0	NS[b]	1.12 (0.88–1.45)

Abbreviations: PDI: probable depressive illness; LQ: Leverton questionnaire.

[a] P value, odds ratio and 95% confidence interval of comparison of categorical data with Fisher exact test or chi-square test.

[b] Statistically not significant.

PDI and non-PDI mothers (rate of unplanned pregnancy: 31.2% vs. 22.1%, respectively). As expected, the occurrence of unwanted pregnancy was relatively small, as were the differences observed between the PDI and non-PDI group in this regard.

Psychosocial factors potentially associated with PDI are listed in Table 2. There was a significant association between a past history of a major depressive episode and PDI (OR: 4.6). The likelihood of developing PDI was nearly 3 times higher in those with major life events during the year prior to testing. Interestingly, a poor relationship between the mother and her partner was not a risk factor for developing PDI (OR: 0.81). As expected, the lack of perceived support by the partner appeared to increase the likelihood of PDI (OR: 1.36), as did the lack of family support (OR: 1.39).

The likelihood of PDI was almost double in those reporting a low income (OR: 1.9). Relative to non-depressed mothers, significantly fewer depressed mothers intended to return to work after postpartum period (OR: 0.44), whereas independent style of management of everyday life problems was not distinguishing between the two groups.

3.2. Simultaneous risk factors of PDI as determined by multiple logistic regression analysis

Table 3 presents the logistic regression model, including parameters and corresponding adjusted odds ratios (AORs) for PDI as compared with the non-PDI mothers. There was no multicollinearity between the significant variables and the liner correlation of the logit odds was significant.

There was no significant association between PDI and the type of residence of the mother, despite the difference experienced in the single comparison. Primiparity had a small but significant risk-reducing effect on PDI. Like in the univariate analyses, the lack of perceived support from the partner or the family had strong effects on PDI, with odds ratios suggesting an increased risk. It is of note that women who had treatment due to infertility

Table 3
Stepwise multiple logistic regression analysis for evaluating PDI during pregnancy.

Variable	*P* value	Adjusted OR[a]	95% CI[b]
Primiparity	0.008	0.78	0.67–0.95
Lack of support by the partner	< 0.001	1.79	1.32–1.89
Lack of support by family	0.018	1.23	1.10–1.41
Previous sterility	0.004	0.26	0.14–0.42
Previous unfavourable obstetric outcome	< 0.001	1.42	1.19–1.69
Unplanned pregnancy	< 0.001	1.12	1.03–1.20
History of major depression	< 0.001	3.23	2.22–4.00
Major life events in past year	< 0.001	2.43	1.42–3.77

Abbreviations: PDI: probable depressive illness; LQ: Leverton questionnaire.
[a] Adjusted odds ratio.
[b] 95% CI: 95% confidence interval.

before they became pregnant had lower odds of PDI, with history of infertility appearing to act as a protective factor. Spontaneous or induced abortion or stillbirth in the obstetric history appeared to be relatively strong predictors in a multiple regression analysis. A history of depression and major life events experienced in the past year posed a risk for PDI, and their effect was remarkably stronger than that of the previous variables. Unplanned pregnancy seemed to increase the odds of PDI to a relatively small extent.

4. Discussion

4.1. Psychosocial and obstetric risk factors in PDI during pregnancy

Our findings suggest that the prevalence of PDI among pregnant women in Hungary, 17.2%, is not specifically higher than that in most Western populations (de Tychey et al., 2005; Lancaster et al., 2010; Gaynes et al., 2005). There is a relative dearth of data from the rest of the world, and to our knowledge ours is the first report on PDI during pregnancy from Central Europe. As regards sociodemographic characteristics, the overall number of pregnancy terminations has declined in parallel with the number of live births during the past decade (Hungarian Statistical Office, 2007; Bunevicius et al., 2009). Similarly to Western European countries, there has been a shift in Hungary towards delaying childbirth, due to the more career-oriented lifestyle of women, besides other social and economic reasons (Hungarian Statistical Office, 2007; Kozinszky et al., 2002). In the middle of the 1990s in Hungary, around 80% of unintended pregnancies were prevented either by modern contraception or terminated by abortion. By 2002, merely 2% of live births could be classified as unwanted pregnancy (Hungarian Statistical Office, 2007). In our study, the corresponding figure was 4.2%. It is of note that, similar to our findings with PPD (Kozinszky et al., 2011), we detected a remarkably higher rate of unplanned pregnancy amongst pregnant women with PDI (31.2%) as compared to controls (22.1%), which is in line with the 17% reported for 2002 in Hungary (Hungarian Statistical Office, 2007). A greater prevalence of depressive disorder during pregnancy is independently associated with unplanned and unwanted pregnancy (Lancaster et al., 2010; Bunevicius et al., 2009).

Although the overall purchasing power parity values for Hungary have increased over the 10-year period prior to our study, in 2006 more families fell into the lower economic bracket than 10 years earlier and more mothers were compelled to return to work after giving birth due to the unfavourable socioeconomic circumstances (Hungarian Statistical Office, 2008) with its potential health consequences. Interestingly, economic factors (self-reported low income and intention to return to work after the postpartum period) seemed to be less convincingly influential on PDI during pregnancy than on PPD (Kozinszky et al., 2011); as regards PDI during pregnancy, they only appeared to be significant risk factors in univariate (but not in multivariate) analyses.

In accordance with previous studies, we observed that the presence of a previous minor/major depressive disorder was significantly associated with antepartum depression (Kozinszky et al., 2002; Bunevicius et al., 2009; Goyal et al., 2010; Lancaster et al., 2010); whereas the independent management of everyday problems was not a significant predictor.

Families now tend to raise fewer children (Hungarian Statistical Office, 2007), at a later age, after a more risky pregnancy than earlier (Kozinszky et al., 2002; Bunevicius et al., 2009), which can give rise to PDI during pregnancy more easily (Lancaster et al., 2010). It is of relevance that an average of 1.6 children are born per families in Hungary and the mother is at least 27 years of age at the first childbearing (Hungarian Statistical Office, 2007). The mothers in our sample were of a similar age (27.75 ± 4.51 years), with a similar number of children (1.58 ± 0.92), with no significant difference between the study groups. Apart from the increasing jeopardy of the instability of relationships, the decrease in fertility with increasing age could also be a genuine risk factor (Kozinszky et al., 2002). Every third Hungarian child was born out of wedlock in 2006, Hungarian women nowadays being less likely to be married. The mothers in our survey reflected this tendency (the rate of being married at the time of delivery was 66% in 2006). Nowadays, more than half (52.3%) of marriages end with divorce (Hungarian Statistical Office, 2007).

Interestingly, in our study a married status did not play an important role in triggering or protecting from PDI during pregnancy, whereas others concluded that living alone is associated with a higher chance of developing a depressive illness (Bunevicius et al., 2009; Lancaster et al., 2010; Melville et al., 2010). A possible explanation for this paradox is the trend of raising a child in a cohabitant relationship, which does not necessarily mean that the relationship is unstable. An unstable relationship with the partner has been described to have a detrimental effect in terms of depression risk (Pajulo et al., 2001; Bunevicius et al., 2009; Lancaster et al., 2010), however, in our study, we found no significant effect in either univariate or multivariate analyses, which is a surprising result. In our multiple regression model, unstable relationship was displaced by lack of support from partner.

It is evident that a lack of support from her partner and family may force a mother to try and overcome her everyday problems alone, which makes it necessary for the mother to overcome her distress (Pajulo et al., 2001; Lancaster et al., 2010; Melville et al., 2010). Similar to what we saw in PPD (Kozinszky et al., 2011), with an increasing trend in Europe for couples not to get married, we predict that the stability and quality of the relationship will likely take over the protective quality against depression of being married, as not being married is becoming more common and probably less of a sign of relationship problems and a risk factor for perinatal depression.

Our study has provided further evidence that perceived support from the family environment can help the mother (Pajulo et al., 2001; Lancaster et al., 2010; Melville et al., 2010). However, it is difficult to assess causal relations, and to establish whether depression during pregnancy is caused by a lack of support or it distorts a depressed mother's perception of her environment's attitude.

When the features were examined simultaneously, family-related risk factors (lack of partner and family support) still appeared important. However, a history of depression and life stressors in past year, as other 'traditional' risk factors, still seemed to be the strongest predictors. Although stressful life events and depression are consistently found to be strongly associated, establishing the degree to which stress has a causal

effect in triggering antepartum depression is difficult and would require a very complex analysis (Kendler and Gardner, 2010).

Contrary to what we had previously found in PPD (Kozinszky et al., 2011), the probability of PDI was lower among mothers who expected their first newborn. This is inconsistent with the result of a previous review (Lancaster et al., 2010). A significant proportion of primiparas have a history of infertility and IVF, and becoming pregnant is a very positive experience for these women, according to our data, reducing the prevalence of antepartum mood disorder, whereas obstetric complications, which are more common in these women (Kozinszky et al., 2002), are likely responsible for the increase in the risk of postpartum depression (Adouard et al., 2005).

4.2. Methodological issues

Our study has some strengths that deserve mentioning. As far as we are aware, this is the first study to use a logistic regression analysis model to evaluate the determinants of PDI during pregnancy. Robust, simultaneous estimates of multiple risk factors were possible due to the fairly extensive data set collected from each participant. Conducting a personal interview enabled us to reduce the likelihood of misdiagnosed perinatal depression and the overestimation of the observed risk factors relative to the results of self-reported questionnaire surveys (Austin, 2003; Cox and Holden, 2003). It was a limitation of our study that we did not conduct diagnostic clinical interviews with psychiatrists to establish a clinical diagnosis of depression; however, our previous study (Csatordai et al., 2009) had proved that the LQ had excellent sensitivity and specificity for PND when compared against a full psychiatric assessment. In fact, we are only aware of a few studies that used a clinical interview for the diagnosis of antepartum depression, whereas the decisive majority relied on estimates based on scoring above a cut-off score on established screening tools.

Another advantage of our report is that it is based on a large community sample in Central Europe. Eberhard-Gran et al. (2001) pointed out that many published predicted value estimates are exaggerated, because they are measured in higher-prevalence populations. It is important to note that only a small proportion of the eligible women declined to participate in the study (13.2%). It was a strength of our study that we surveyed a chosen set of questions exploring the effect on the mothers their intention to return to work, their financial difficulties, or their perceived support from their social environment.

This study has been the first and only wide-ranging survey in Hungary so far, drawing attention to the relatively high rate of depression in pregnant mothers in Hungary. Our findings, consistent with reports from the most developed countries with regard to some but not all risk factors (e.g. primiparity, history of unfavourable obstetric outcome), raise the question of the need for a different approach for the detection of depression during pregnancy in this part of Europe. Overall, in Hungary socioeconomic factors seem to play a less significant role in PDI during pregnancy than do psychosocial and pregnancy-related ones. Universal screening during pregnancy appears desirable and the improvement of family functioning and protection from unplanned pregnancy logical targets for intervention.

Appendix 1

Did you plan to get pregnant? Y/N
Is your pregnancy unwanted? Y/N
Do you get practical or emotional support from your partner? Y/N
Do you get practical or emotional support from your family? Y/N
Do you consider your relationship with your partner stable? Y/N
Do you prefer to sort out your problems by yourself? Y/N
Do you have any financial problems? Y/N
Do you intend to return to work within 6–12 months after delivery? Y/N

Please indicate which of the following has affected you over the last year (you can choose multiple responses):

1. Divorce or separation
2. Serious problems in the relationship with your partner
3. Serious conflict with a family member, friend, or neighbour
4. Serious problems at work or school
5. Serious financial problems
6. Serious injury or illness in you
7. Serious injury or illness in a family member
8. Serious roadt traffic accident, fire, or theft
9. Loss of a close familty member
10. others:……

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