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Psychosocial risk factors and screening options for perinatal psychopathologies

Ph.D. Thesis

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Publications related to the thesis

I. Töreki, A., Andó B., Keresztúri A. et al. The Edinburgh Postnatal Depression Scale: Translation and antepartum validation for a Hungarian sample. Midwifery 2012;10.1016/j.midw.2012.01 in press.

II. Dudás R., Csatordai S., **Töreki A**. et al. Obstetric and psychosocial risk factors for depressive symptoms during pregnancy. Psychiatry Research 2012; 10.1016 in press.

III. Töreki A, Pál A, Szokolszky Á. et al. A prenatális szorongás és depresszió alakulása egészséges terheseknél, összevetve a postnatális depresszió kialakulásának esélyeivel. Magyar Nőorvosok Lapja 2010; 73:267-271.

Content

List of abbreviations

EPDS=Edinburgh Postnatal Depression Scale

AND=Antenatal depression

PND=Postnatal depression

GHQ=General Health Questionnaire

PTSD=Posttraumatic Stress Disorder

WHO=World Health Organization

DSM-IV= Diagnostic and Statistical Manual of Mental Disorders

SCID-I= Structured Clinical Interview Axis-I Disorders

OCD= Obsessive compulsive disorder

SSRI= Selective serotonin re-uptake inhibitors

S.D.=Standard Deviation

ROC= Relative operating characteristic

ICC=Intraclass coefficient

SPSS= Statistical Package for Social Sciences

AUC= Area under curve

ISPOG= International Society of Psychosomatic Obstetrics and Gynaecology

MAPSZIG= Magyar Pszichoszomatikus Szülészeti-Nőgyógyászati Társaság

CIDI=Composite International Diagnostic Interview

PPV=Positive predictive value

BDI=Beck Depression Inventory

MDD=Major depressive disorder

STAI= State-Trait Anxiety Inventory

LQ= Leverton Questionnaire

1. Introduction

1.1. Psychosomatics in the perinatal period

As a consequence of the increasing prevalence of mood disorders, their screening, diagnosis and therapy have represented an outstandingly important challenge for public health, as they can be risk factors for other frequently occurring diseases, for example cardiovascular diseases, cancers, eating disorders, diabetes mellitus, etc. According to a WHO prognosis, depression is projected to be the second among cause leading to early mortality by the year 2020 [1].

Ideas of the diagnostics and treatment of psychiatric disorders in the postnatal period date back to the second half of the 19th century, however specific advancements happened only in the 1960s. The first epidemiologic studies highlighted the need for a larger involvement of psychiatric methods in the postnatal period [2]. The first prospective study is conducted by Pitt et al., concluding that somewhat 11% of the subjects suffered from neurotic depression in the first 6 months after birth [3]. In that period this disease was still regarded to be a result of perinatal hormonal changes, and for this reason they introduced progesterone therapy in the 1970s, which represented the first measure of curative therapy in this type of disease [4].

Studies have proved that 33.3% of the women show any signs of depression, whose most vulnerable period can be assigned to the reproduction span [5]. Physical and hormonal changes occurring in the perinatal period lead to alterations in mental status. Physiological alterations in the postnatal period (decrease in the serum levels of progesterone, oestradiol, prolactin, cortisol, β-hCG, β-endorphin) also have influence on serotonin production which likewise brings about mood changes [6].

Mood changes can occur in different intensity in the three trimesters of pregnancy: women are the most sensitive to psychological alterations in the first and third trimesters, whereas the second phase is rather a content period, free of psychopathological symptoms [7].

1.1.1. Psychological changes in the first trimester

Sensitiveness in the first trimester of the pregnancy can be explained by the following reasons: nausea and hyperemesis are frequent symptoms in the first period of the

pregnancy often coinciding with the symptoms of depressed mood and anhedonia. Due to their possible teratogenic effects, one should avoid the administration of the medicaments aimed to alleviate psychological symptoms and taken on a daily basis in the preconceptional period; therefore ceasing anti-anxiety or antidepressant pills increases the tension in pregnant woman in the first period of the pregnancy.

This is also the period of the raising apperception: male and female roles are redefined; identities of the mother and the father start to outline. Furthermore, the pregnant woman's relationship with her own mother gains new understanding: emotion augmentation occurs, and unspoken conflicts demand solutions [8].

High percentage of spontaneous abortions occurs in the first trimester of pregnancy. This period implies special care, attention, fear and anxiety. Occasional bleedings or abdominal cramps can generate extreme levels of anxiety in pregnant women.

All the abovementioned phenomena conclude that psychological screenings performed in the first trimester detect psychological vulnerability either in terms of depression or anxiety.

1.1.2. Psychological changes in the second trimester

The second trimester is a significantly calmer period. The fact of pregnancy has become accepted; identification with the forthcoming maternal role and true preparations for welcoming the baby.

Nausea has almost ended by this time, and the presence of the foetus becomes palpable by the sensation of foetal movements, which provide the pregnant woman with a sense of security [7].

This second phase is the period of real preparation: the pregnancy is certain, whereas the process of delivery does not cause anxiety yet.

Several Hungarian and international investigations have proved that results provided by instruments screening depression and anxiety indicate less psychopathology in this period than in the other two trimesters [7].

1.1.3. Psychological changes in the third trimester

7

The third trimester is the period of the preparation for birth. Anxiety about the outcome of the delivery has increased by this time; particularly worries in connection with mode of delivery, pains, possible disorders and complications come into focus [7].

Abdominal enlargement of the pregnant woman has already become significant by this time causing hindrance to the accustomed lifestyle, moving turns to be more difficult. This state generates expressly depressive mood in many pregnant women. The acceptance of altered body image represents a psychological burden on pregnant women in numerous cases [7].

Social background is the factor that has significant influence on expectant women in all three trimesters. Supportive family attitude, the father's protecting behaviour toward his newly forming family, the tolerant attitude of both the micro and macro environment represent very important protective factors against antenatal mood swings [7].

1.2. Frequency and consequences of ante- and postnatal depressions

Depression is characterised by behavioural and emotional disturbances, slowdown of thinking and decreasing physical activity. Mood disorders are accompanied by well definable body symptoms (somatisation). A Hungarian survey performed in 1997 suggests that almost 32% of the population suffered from symptoms of depression, with a ca. two times higher prevalence in women in reproductive age than in males [5,7].

The years of childbearing used to be conceived as the most psychologically vulnerable period for a woman, but latest studies indicate that prevalence of antenatal and postnatal depression is similar to that in other periods of life [9,10].

Minor depression is not regarded as a psychiatric disorder, but is extremely frequent during pregnancy (4.8%) and in the first year after delivery (26.4%) [11,12].

Criteria for the diagnosis of minor depression are the following (based on DSM-IV SCID-I): the presence of two main symptoms (permanent depressed mood and anhedonia) with one or two additional subsymptoms (sleeping disturbance, eating disorder, cognitive dysfunction, chronic fatigue, psychomotor restlessness, loss of interest, guilt), or at least the presence of three subsymptoms [11,12,13,14]. This disorder most often appears in the first and last trimester, and can be the forerunner of

postnatal depression. Its symptoms disappear spontaneously in most cases, but can also predict the development of a major depression wich is mostly be characteristic of the weeks just before delivery and the postnatal periods. Permanent depression and inability to find joy in any activities, and even suicidal thoughts can occur in this psychological disorder [13]. Therefore special attention from the micro-milieu is important in the perinatal period, since its members can not only be the first to detect the symptoms but with a supportive attitude they can also provide solutions for the mother [7].

The prevalence of major antenatal depression ranges between 3-20% [15,16]. This percentage may change according to whether it is a planned or unplanned pregnancy; in the latter case the possibility of developing depressive symptoms already in the first trimester can multiply [17]. Moreover, pregnancies complicated with depression have a two times higher risk for premature labour than physiological pregnancies without depression [18].

Additionally, the mother's antenatal depression can also lead to low birth weight of the newborn, which has been revealed to correlate with developing cardiovascular diseases in adulthoods [19]. Lower scores were reached in cognitive tests by those children whose mother suffered from mood disorders during pregnancy, or in the postnatal period, moreover, the mother's positive psychoanamnesis has likewise negative influence on the child's creative play. Sleeping and eating disorders are also proved to be more frequent in the children of depressed mothers [19].

1.3. Anxiety disorders in the perinatal period

Almost each anxiety symptom can be associated with other perinatal psychopathologies. They can occur temporarily, in the form of an attack, but also can be of chronic course. The degree of severity and permanence can have negative influence on the quality of life, thus leading to further symptoms [20].

1.3.1. Panic disorder

Anxiety symptoms in panic disorder – asphyxia, palpitation, tremor, shaking, sweating, glowing, shivering, abdominal pain, fear of death, fear of loosing self-

control – appear unexpectedly in the form of attacks [20]. Thus, patients dare to leave their homes less frequently after a while, leading to significant narrowing of their elbowroom. Panic disorder manifests itself gradually in the perinatal period. The reason for this is that this psychopathological disorder affects women predominantly (2/3 women vs. 1/3 men); the first appearance of the symptoms can be observed in women at their early twenties, and the age group mostly affected is between 20 and 40 [21]. All these reveal apparently that this is a disease of the reproductive age making it inevitable for obstetricians to place great emphasis on this disorder. Patients suffering from panic disorders describe their attacks to be significant psychological and physical burden on their lives. Medical treatment is often necessary; otherwise patients regard anxiety attacks unbearable. Consequently, women suffering from panic disorder do not dare to plan pregnancy, as they do not want to give up taking medication during the course of pregnancy either. But if they decided to get pregnant, they have two options: they can either continue pharmacotherapy, thus running a risk of embryonic malformation in the first trimester, or suspend pharmacotherapy and continue pregnancy under increased level of anxiety or depressive symptoms. The latter case, however, can lead to severe consequences: spontaneous abortion, foetal tachycardia, premature labour, anaemia, polyhydramion, placental malformation, emergency caesarean section, and postnatal mood disorders complicate the perinatal period more frequently in this case [21,22].

Nevertheless, pregnancy may have a good impact on panic disorder, since the increased level of progesterone has a protective effect against panic attacks; whereas quite the opposite effect can prevail in the postnatal period, when progesterone level declines [7]. In contrast, in Ozkan's study, there was no significant difference between the frequency of panic attacks in pregnant and non-pregnant women [22].

All things considered, it is necessary to declare that women suffering from panic disorder represent a significant 'at-risk' population in the perinatal period.

1.3.2. Phobias

Phobias – fears of certain things –are also classified among anxiety disorders [20]. A phobia can, for example, manifest itself as agoraphobia, or in the form of hypochondria, i.e. the anxiety culminates in the fear of diseases. Pregnancy is considered to be a sensitive period from this aspect. Pregnant women undergo several

medical examinations during the three trimesters, which may cause serious anxiety to women prone to hypochondria.

1.3.3. Obsessive compulsive disorder (OCD)

The syndrome termed obsessive compulsive disorder is characterized by compulsive ideation, e.g. thoughts felt to be senseless, impractical, and ego-dystonic [20]. As a response to these compulsive thoughts, actions and attitudes can appear in patients suffering from OCD that must be performed according to forcing rigid rules. Anxiety is caused on one hand by compulsive thoughts and actions, and on the other hand it right occurs when performance of these actions is hindered [20]. This psychopathology is most common in the postnatal part of the perinatal period. Women face new tasks to do, which imply the prioritisation of old tasks, the set-up of a new order of priorities. Several women who are perfectionist cannot overcome obstacles that prevent from doing routine activity, and their anxieties manifest themselves in the form of compulsive behaviour [23]. Compulsive ideas in the perinatal period often focus on the foetus, or the newborn. The appearance of the compulsive idea of doing harm to the baby is not rare in this period.

1.3.4. Posttraumatic stress disorder (PTSD)

Posttraumatic stress disorder can dominantly affect those people who met with an accident, suffer mental, physical abuse, or are victims of natural disasters. These patients re-live their traumatic experiences by recollections causing intensive anxiety to them [20]. In obstetrical practise, miscarriage, stillbirth, death of the newborn, or the delivery of an ill newborn, or even a complicated birth that ends up with caesarean section can lead to posttraumatic stress disorder later on [24, 25]. Flash-back of memories can interfere with everyday life worsening daily routine and causing symptoms of anxiety.

1.4. Pharmacotherapy of psychiatric disorders in the perinatal period

The administration of tricyclic antidepressants should be avoided during pregnancy, because these are more likely to lead to foetal malformations, whereas the usage of

selective serotonin reuptake inhibitors (SSRI) is proved to be less harmful [7,26]. In case of major depression or psychosis the smallest effective therapeutic dose of lithium or antipsychotic drug has to be adjusted in order to reduce the possibility of foetal malformations or spontaneous abortion.

The dosage of psychopharmacons have to be further decreased towards the end of pregnancy, otherwise discontinuation syndrome can develop in the newborn [7,26].

Advantages and disadvantages of pharmacotherapy have to be assessed also during breastfeeding, as active substance of the applied medication excreting into mother's milk can be harmful to the newborn [7,26].

Electroconvulsive therapy can be safely applied in both the ante- and postnatal periods [7].

1.5. Psychodynamic explanations of perinatal mood disorders

Several psychodynamic explanations have been created for psychological changes during pregnancy [27].

According to the psychoanalytic theory, pregnancy is a significant milestone in women's personality development, since not only deeply buried conflicts can come up to the surface of conciousness, but also the pregnant woman has to form an object relationship with her foetus, which emerges from her own self. A mother's object identification with her foetus depend on two things: on one hand it is the mother's self, whereas the other is the skill of object relation that is rooted in the pregnant woman's history of life [27].

Developmental psychology model declares that as pregnancy evokes regressive mechanisms, it is by all means essential for pregnant women to have mature personality. Child and adult identities have to be integrated in order to reach parental identity. Communication and role identity gain greater significance in this model, as parental role can only be reached through psychological development [27].

The model of instincts dynamics is composed of the Freudian libido theory and self psychology, which is effective together with hormonal activity. In the development of mother role the pregnant woman places great emphasis on the relationship with her own mother and her concept of maternal role, namely the reaching of ideal self [27].

The model of narcissism builds on a dichotomy that is experienced by the pregnant woman, who regards her foetus as being her own part, and simultaneously an independent being. Therefore the issues of self respect and self-esteem are

continuously present throughout the course of pregnancy, and can threaten the narcissistic needs of the pregnant woman [27].

2. Objectives

The aim of the study is to detect antenatal and postnatal mood disorders in the following way: we intend to survey pregnant and postnatal woman's psychological condition using the method foreign experts have already applied in relation to the postnatal period [28,29]. As no EPDS validation process on the mentioned period has ever been conducted in southeastern Hungary, our objectives are as follows:

- On one hand, we would like to provide a screening tool for perinatal experts working southeastern Hungary by the antenatal and postnatal validation of EPDS scale – created by Cox et al. in 1987 – by which depressive symptoms can be securely screened in the initial phase of the disease, and thus women being pregnant or in postnatal period be referred to experts who can provide medical care.
- On the other hand, we would like to shed light on correlations between socio-demographic features and EPDS scores. Screening for these factors can contribute to the elaboration of targeted prevention.
- Finally, the aim of our investigation was to gain accurate quantitative information about the proportion of women suffering from psychopathological symptoms in the perinatal population of southeastern Hungary.

3. Material and method

3.1. Antenatal sample

We selected in their 12 weeks gestational age for the antenatal section of our study, who came to undergo nuchal scan at the Ambulatory Care Center of Department of Obstetrics and Gynaecology in the period between July and December 2010. The number of pregnant women involved in the study was 219, of which no one refused to participate. We regarded it as exclusion criteria if a subject did not speak Hungarian,

was illiterate, under-eighteen, or suffered from any psychiatric disorder that was going to distort the results.

3.1.1. General socio-demographic features

The average age among those 219 subjects in our study is 30 years (S.D 4.71 years, 18-42 years). The average age of the primiparous women is 28.6 years (S.D. 4.9 years), and that of the multipara is 31.8 years (S.D. 3.9 years). The average number of the children of multiparous woman is 1.38 (1-6 children). 56.2% of the study subjects are primipara and 43.8% are multipara. 46.1% of them attended higher education, while 47.1% of them completed secondary education. 6.8% of the subjects finished 8 years of primary education or less than that. 74% of them live in Szeged or other town, 26% in villages or farmsteads. 80.8% of the pregnancies were planned, 14.6% were unplanned, whereas 4.6% of them were unwanted, but mothers still continued the pregnancy (Table 1).

3.2. Postnatal sample

Recruiting postnatal women for the investigation happened in the 2-3rd days after childbirth in the Postnatal Department of the Clinics of Obstetrics and Gynaecology in Szeged between July 2010 and March 2011. We informed the puerperal subjects about the aim of our study then, and requested them to indicate their intentions to participate in the study six weeks after the delivery to undergo a psychological examination by filling out an informed consent form and a socio-demographic datasheet. 84 people refused to fill out the datasheet in the Postnatal Department. Altogether 638 people had indicated to participate in the examination after 6 weeks but only 266 of them underwent the examination. (No overlap occurs between the antenatal and postnatal samples.) No one among those 266 subjects refused to fill out the EPSD questionnaire.

Six weeks after the delivery mothers underwent the same study procedure as those involved in the antenatal study.

3.2.1. General socio-demographic features

62% of the 266 study subjects were primipara and 38% was multiparous women. The average age was 30.5 years (S.D. 5.47 yrs), the average number of children was 1.52 (S.D. 0.82 yrs). 98.1% of the study subjects live in relationship, whereas 1.9% of them

raised their children alone as single mothers. 86% of them live in Szeged or other town, while 14% of the mothers live in villages or farmsteads. 84.3% of this sample planned the pregnancy, 14.7% did not plan, whereas 1.9% of them unwanted the pregnancy (Table 1).

Both the antenatal and postnatal studies were approved by the Clinical Research Ethics Committee of the University of Szeged (100/2010), and both phases were carried out according to the Declaration of Helsinki and the Oviedo Convention.

Table 1: Socio-demographic data of ante- and postnatal samples

	ANTENATÁL participants	POSTNATÁL participants
AGE		
Age (mean±S.D.)	30 years (S.D.=4.71 years)	30.5 years (S.D=4.6 years)
Primipara	28.6 years	28.9 years
Multipara	31.8 years	33 years
PARITY		
Primipara	56.20%	62%
Multipara	43.80%	38%
Multipara avg. no. of children	1.38	1.52
LEVEL OF EDUCATION		
Tertiary	46.10%	58.60%
Secondary	47.10%	39.47%
Primary	6.80%	1.88%
TYPE OF RESIDENCE		
Town	74%	86%
Village, outlying area	26%	14%
PLANNING OF PREGNANCY		
Planned pregnancy	80.80%	83.40%
Unplanned pregnancy	14.60%	14.70%
Unwanted pregnancy	4.60%	1.90%
MARRIED OR COHABITANT	99.10%	98.10%

3.3. Measurement methods applied in the study

We primarily applied the Edinburgh Postnatal Depression Scale (EPDS) questionnaire in our study, which was elaborated by Cox et al. in 1987 with a view to creating a measuring device that can be applied verifiably in the postnatal period, too. Former depression screening tools proved to be useless, since answers given to questions concerning somatic changes (e.g. quality of sleeping, weight loss) do not in all cases indicate depressive mood, but those rather refer to physiological processes, i.e. they interfere with pregnancy and the physiological changes of pregnancy and postnatal period [28].

The questionnaire consists of ten items with four possible answers each (Appendix 2). In addition to the mapping of usual depressive symptoms, the exploration of anxiety symptoms has also been included; and the final question asks about the risk of suicidal ideation. This questionnaire aims at measuring the mood condition during the period of the passed one week.

Answers to the questions can be assigned scores ranging between 0 and 3 points. The maximum number of scores available of the questionnaire is 30 scores. According to the international validations, the questionnaire indicates major depression in the antenatal period above 7-13 scores, whereas in the postnatal period above 10-12 scores [29].

Our validation process was conducted in the following way: the 10 items of the EPDS were translated from English to Hungarian by a psychiatrist and an obstetrician both being Hungarian-born and living in English-speaking area. The re-translation of the questionnaire to English was made by a psychologist who was not familiar with the original English version of the EPDS form. An English translator made the semantic validation of the re-translated English version and compared it with the original form. We tested the Hungarian version on our study subjects subsequently, who understood the questions, and pronounced those unequivocal and not confusing. After all these we considered the translation process to be completed (Appendix 2).

The other measuring device we applied is DSM-IV SCID-I Psychiatric Diagnostic Interview, which is the most frequently employed type of diagnostic process in psychiatry. We recorded the section from Module A to F of SCID-I involving the study subjects in the form of interviews, which consist of the following psychopathologies: mood episodes, psychotic and psychotic-like symptoms, disorders associated with alcohol or other psychoactive substances, anxiety and other disorders [13].

As a consequence of the validation process, study subjects repeatedly filled out the EPDS questionnaire three days on average after the psychological screening. 56% and 59% of the distributed questionnaires (antenatal and postnatal, respectively) were returned.

3.4. Statistical methods

We employed Spearman correlation for assessing the relationship between EPDS scores and DSM-IV diagnosis. For the individual groups (major depression vs. minor

depression vs. controls) we applied analysis of variance (ANOVA) to compare EPDS scores, which we supplemented with post-hoc test (Bonferroni correction).

EPDS validation was tested by the application of sensitivity, specificity, positive and negative predictive values for possible cut-off scores, and compared to minor and major depression criteria of the DSM-IV. We determined EPDS cut-off scores with regard to major and combined (major+minor) depression by means of the ROC curve analysis.

We calculated Cronbach's coefficient alpha and Guttmann coefficient, which determine internal consistency, of the test parameters measuring reliability range. Test-retest reliability of values is to be approved if it represents a value above 0.7. By filling out the test-retest we established acceptability by presenting the Intraclass Correlation Coefficient (ICC, which is optimally above 0.7) and the Spearman rank correlation coefficient, which is concluded from the distinction between the two tests' total scores (acceptable above 0.5).

We completed the statistical analysis using SPSS 16.0 program (Statistical Package for Social Sciences). We considered significance limit to be p=0.05.

3.5. Research process

The gestational age of those who participated in the study had already been 12 weeks. Study subjects could get information about the study aims from a cover letter, and we assured them that we were not going to use their data put at our disposal in any other case, or misuse their personal data.

The 266 study subjects of the postnatal population participated in the psychological examination 6 weeks after childbirth when they filled out an EPDS questionnaire again, and took part in an SCID-I interview.

4. Results

4.1. Statistical results

4.1.1. Distribution of EPDS scores

4.1.1.1. Antenatal sample

Table 2 presents Cronbach's coefficient alpha values of the EPDS test on the antenatal sample. Cronbach' alpha was 0.77 for the total EPDS test, while Guttmann split-half

coefficient was 0.778, which represent acceptable consistence. The coefficient alpha was at least 0.727 for every question. All these mean that alpha test, as the indicator of the questionnaire's reliability, showed nearly similar, acceptable values in each case, consequently, questions of the EPDS move together coherently, and collectively measure depression. The ICC value obtained from the test-retest validation was 0.684 (p<0.001). We may say that the EPDS tests presented acceptable results few days apart, i.e. reliability of the test-retest is good, and questions consistently concern depression (Spearman's Rho was: 0.52, p<0.001). Therefore, our study subjects' scores in their repeated tests did not deviate significantly from their former ones.

Table 2: Cronbach α values for items of the EPDS (antenatal sample)

	Cronbach α value
EPDS	0.77
Items of EPDS	**Cronbach α values**
1. I have been able to laugh and see the funny side of things	0.760
2. I have looked forward with enjoyment to things	0.764
3 I have blamed myself unnecessarily when things went wrong	0.779
4 I have been anxious and worried for no good reason	0.739
5 I have felt scared or panicky for no very good reason	0.727
6. Things have been getting on top of me	0.752
7. I have been so unhappy that I have had difficulty sleeping	0.756
8. I have felt sad or miserable	0.738
9. I have been so unhappy that I have been crying	0.734
10. The thought of harming myself has occurred to me	0.757

Figure 1 shows the distribution of the pregnant women's EPDS scores according to suffering or not suffering from depression. 15 among the inquired 219 subjects were proved to be suffering from minor (6.85%), and 7 from major depression (3%); their average scores were remarkably different from that of the control group. EPDS scores' correlation with SCID results: r=0.5254 (p<0.001). Average scores of the

postnatal women without depression, with minor and with major depression were **4.11** (S.D.=2.52; 0-12), **8.80** (S.D.=3.75; 2-15), and **12.71** (S.D.=7.27; 7-22), respectively. It can be detected that average EPDS scores likewise produced significant rise simultaneously with the increase of the number of depressive symptoms (Figure 1).

Figure 1: EPDS scores by diagnostic group (antenatal sample)
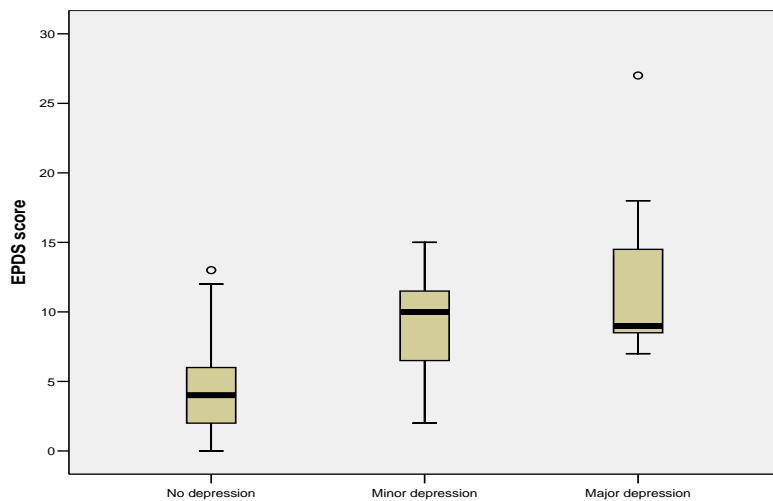
4.1.1.2. Postnatal sample

Table 3 presents the EPDS questions' Cronbach's coefficient alpha on the postnatal sample. The coefficient alpha for the EPDS test as a whole was 0.75, and the Guttmann split-half coefficient was 0.788, which represent acceptable consistence similarly to that of the antenatal, in other words, questions are coherent and the questionnaire is reliable. The coefficient alpha for each question was at least 0.727. The ICC value of the repeated measurement was 0.886 (p<0.001), the Spearman Rho was 0.798 (p<0,001); so the repeated completion of the tests within a short period of time presented results similar to the first ones (Table 3).

Table 3: Cronbach α values for items of the EPDS (postnatal sample)	
	Cronbach α values
EPDS	0.75
Items of EPDS	**Cronbach α values**
1. I have been able to laugh and see the funny side of things	0.725

2. I have looked forward with enjoyment to things	0.737
3. I have blamed myself unnecessarily when things went wrong	0.723
4 I have been anxious and worried for no good reason	0.717
5 I have felt scared or panicky for no very good reason	0.730
6. Things have been getting on top of me	0.725
7 I have been so unhappy that I have had difficulty sleeping	0.738
8 I have felt sad or miserable	0.722
9 I have been so unhappy that I have been crying	0.723
10. . The thought of harming myself has occured to me	
	0.747

Figure 2 presents the distribution of EPDS scores according to diagnostic groups. 36 of the 266 involved postnatal women showed symptoms of minor depression (13.5%), and 8 subjects suffered from major depression (3%), each deviating significantly in terms of average scores from that of the control group. EPDS scores correlated again with SCID results ($r=0.654$, $p<0.001$). Average scores of the healthy subjects and those with minor and with major depression are **4,40** (S.D.=2.73; range: 0-12), **8.78** (S.D.= 3.30; range: 3-15), and **16.63** (S.D.=2.77; range: 13-22) respectively. Similarly to the antenatal results, the increase of EPDS average scores is reliably transparent in the case of the depressive symptoms' rising frequency (Figure 2).

Figure 2: EPDS scores by diagnostic groups (postnatal sample)
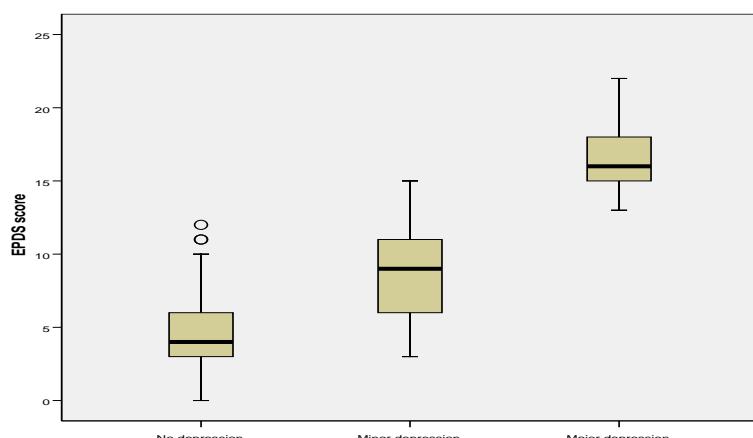
4.1.2. ROC curve analysis

4.1.2.1.Antenatal sample

Figure 3 and 4 present the ROC curve analysis which represents the EPDS scores, the possible cut-off scores of combined (major+minor) and major depression of pregnant women. The area under the curve (AUC) referring to combined depression is 0.88 ($p<0.001$), representing that EPDS can significantly distinguish mentally healthy people from those suffering from depression (either minor or major).

Figure 3: ROC-analysis of the EPDS total score against SCID-I diagnosis of antenatal combined depression
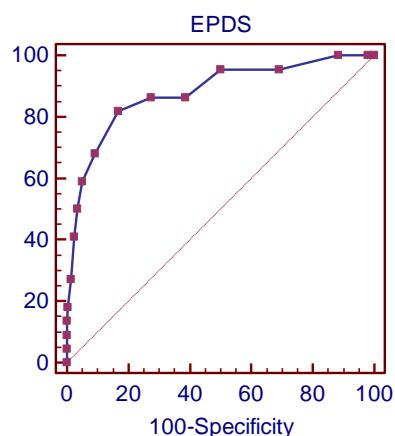
Figure 4: ROC-analysis of the EPDS total score against SCID-I diagnosis of antenatal major depression
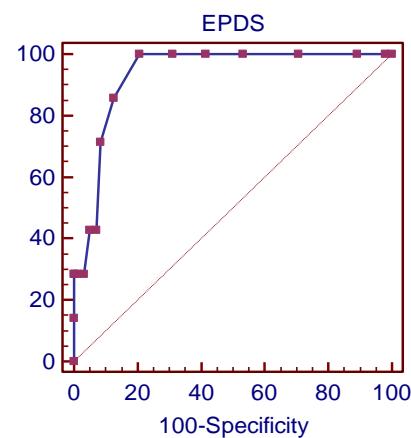
The ideal cut-off score for combined depression is 6/7, with a sensitivity of 81.8% and a specificity of 83.2%. Optimal cut-off score for major depression is 8/9, besides a sensitivity of 71.4% and a specificity of 91.5% (AUC:0.933; $p<0.001$) (Table 4).

Table 4: Range of EPDS thresholds and the corresponding values of sensitivity, specificity and positive and negative predictive values (n=219)

EPDS Thresh.	Sensitivity		Specificity		Positíve predictive value		Negative predictive value	
	Major	Combin.	Major	Combin.	Major	Combin.	Major	Combin.
4/5	100	86.4	57.1	61.4	7.0	20.0	100	97.6
5/6	100	86.4	68.9	72.6	9.3	26.0	100	97.9
6/7	100	81.8	79.2	83.2	13.7	35.3	100	97.6
7/8	85.7	68.2	87.3	92.3	18.2	45.4	99.5	96.2
8/9	71.4	59.1	91.5	94.9	21.7	56.5	99.0	95.4
9/10	42.9	50.0	92.9	96.5	16.7	61.1	98.0	94.5
10/11	42.9	40.9	94.8	98.0	21.4	64.3	98.0	93.7
11/12	28.6	27.3	96.7	98.5	22.2	66.7	97.6	92.4
12/13	28.6	18.2	98.6	99.5	40.0	80.0	97.7	91.6
13/14	28.6	13.6	99.5	100	66.7	100	97.7	91.2

4.1.2.2. Postnatal sample

Figure 5 (combined depression) and 6 (major depression) show results of the ROC curve analysis conducted on the postnatal sample. The area under the ROC curve in the case of combined depression is 0.868 (p<0,001), the ideal cut-off score is 7/8,

presenting a sensitivity of 72.7% and a specificity of 86%. On the basis of the EPDS scores study subjects with and without depression can be distinguished excellently.

Figure 5: ROC-analysis of the EPDS total score against SCID-I diagnosis of postnatal combined depression

Figure 6: ROC-analysis of the EPDS total score against SCID-I diagnosis of postnatal major depression
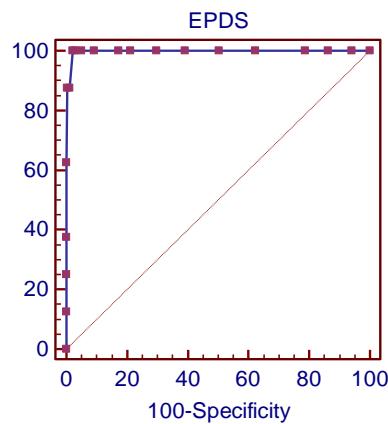
The ROC curve analysis on major postnatal depression yielded significant result (AUC:0.997; p<0.001).

The ideal cut-off score is 12/13, coming with a high sensitivity of 100% and a specificity of 97.7% (Table 5).

Table 5: Range of EPDS thresholds and the corresponding values of sensitivity, specificity and positive and negative predictive values
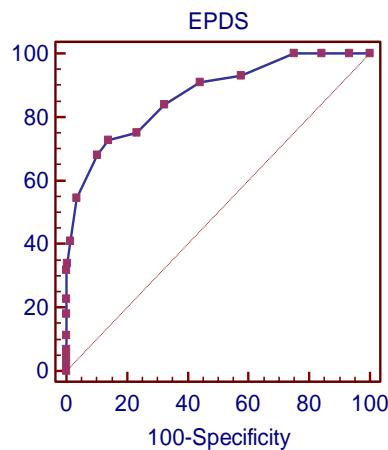**(n=266)**

EPDS threshold	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Combined (major + minor) depression				
4/5	90.9	55.9	29.0	96.9
5/6	84.1	67.6	33.9	95.5
6/7	75.0	76.6	38.8	93.9
7/8	**72.7**	**86.0**	**50.8**	**94.1**
8/9	68.2	89.6	56.6	93.4
9/10	54.5	96.4	75.0	91.5
10/11	40.9	98.7	85.7	89.4
11/12	34.1	99.6	93.7	88.4
12/13	31.8	100	100	88.1
13/14	22.7	100	100	86.7
14/15	18.2	100	100	86.0
15/16	11.4	100	100	85.1
Major depression				
4/5	100	49.6	5.80	100
5/6	100	60.8	7.3	100
6/7	100	70.2	9.4	100
7/8	100	78.7	12.7	100
8/9	100	82.6	15.1	100
9/10	100	90.7	25.0	100
10/11	100	95.0	38.0	100
11/12	100	96.9	49.9	100
12/13	**100**	**97.7**	**57.1**	**100**
13/14	87.5	98.8	69.9	99.6
14/15	87.5	99.6	87.5	99.6
15/16	62.5	100	100	98.9

4.2. Other psychiatric disorders diagnosed by SCID

4.2.1. Antenatal sample

We screened pregnant women from Module A to F applying SCID-I diagnostic interview, which means that we diagnosed anxiety symptoms beyond depression, and we also scrutinized alcohol and drug addictions, and psychotic symptoms.

The interview was conducted after completing socio-demographic questionnaires and the EPDS test. We did not know results of the EPDS questionnaire at the time of recording the interview. The accomplished questionnaire was only assessed after the interview.

We screened the following psychopathological disorders on the basis of the SCID (Figure 7):

- Minor depression: 15 people
- Major depression: 7 people
- Panic disorder: 11 people
- Posttraumatic stress disorder (PTDS): 2 people
- Dysthymia: 1 person

33 people of the 219 pregnant women (16%) have one of the abovementioned psychopathologies.

Figure 7: Antenatal psychopathologies by SCID-I
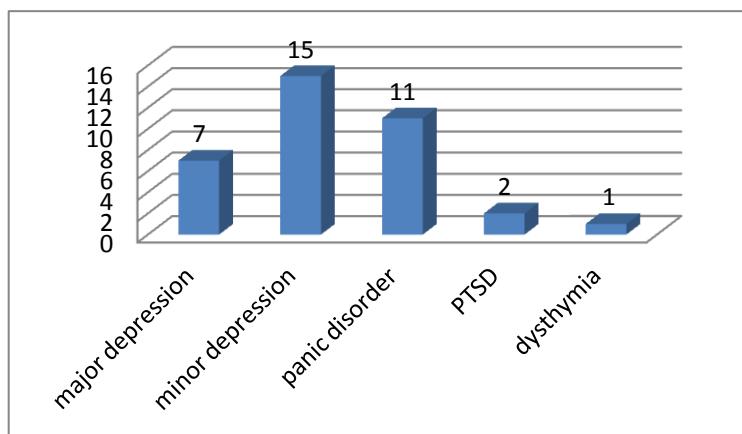
4.2.2.   Postnatal sample

We applied SCID-I psychiatric diagnostic interviews in the case of postnatal study subjects by means of the same method as in antenatal examinations. The abovementioned disorders were represented in the following way:

- Minor depression: 36 people

- Major depression: 8 people

- Panic disorder: 18 people

- PTSD: 2 people

- Psychotic symptoms: 1 person

That is to say, 65 study subjects of the involved 266 people, which is 24.4% - nearly every fourth person – were diagnosed as having pathological deviation.

Figure 8: Postnatal psychopathologies by SCID-I
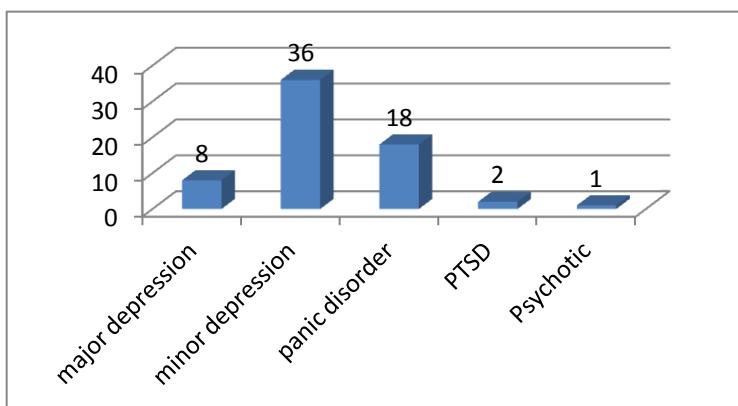
4.3.Correlation between socio-demographic factors and EPDS

4.3.1.   Correlation between place of residence and EDPS

4.3.1.1. Antenatal sample

Three-fourths of the subjects participating in the antenatal examination had urban residence, in Szeged or in other town of the southeastern region of Hungary. The remaining one-fourth of the subjects lived in villages, or farmsteads. The average EPDS score in the case of villagers was higher (4.98 scores), while urban inhabitants reached lower scores (4.58) in EPDS test (p=0.473). Consequently, we may assume

that pregnant women living in villages or peripheries are more prone to suffer from depressive symptoms (Table 6).

Table 6: Type of residence and the EPDS scores (antenatal sample)

	Rate	EPDS mean
Town	74%	4.58 scores
Village, outlying area	26%	4.98 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.1.2.Postnatal sample

We conducted postnatal examinations on different subject than antenatal one. The percentage of urban inhabitants is remarkably higher (86%) than those living in villages or rural areas (14%) in this sample. This ratio differs significantly from the antenatal sample, which is explained by the following: postnatal examinations took place six weeks after delivery, for which urban inhabitants returned in greater proportion.

The average EPDS score for the urban population was 5.52 scores, whereas that of the villagers and dwellers of farmsteads was 4.6 scores (p=0.126), which refers to a more increased psychological burden on urban population (Table 7).

Table 7: Type of residence and the EPDS scores (postnatal sample)

	Rate	EPDS mean
Town	86%	5.52 scores
Village, outlying area	14%	4.6 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.2. Correlation between planning of pregnancy and EPDS

4.3.2.1. Antenatal sample

80.8% of the study subjects in the antenatal sample planned the pregnancy (4.36 scores), and 14.6% of them did not plan it (6 scores), while 4.6% of the pregnancies were unwanted (7.9 scores) (0.001) (Table 8).

Table 8: Planning of pregnancy and the EPDS scores (antenatal sample)

	Rate	EPDS mean
Planned	80.80%	4,36 scores
Unplanned	14.60%	6 scores
Unwanted	4.60%	7,9 scores

EPDS=Edinburgh Postnatal Depression Scale

It is essential to clarify distinction between *unplanned* and *unwanted* pregnancies: study subjects generally supplemented their notion of *unplanned pregnancy* with the explanation that they had been living in stable partnership and had already talked about the possibility of having a baby, but at a later time. In contrast, those who were carrying an *unwanted* pregnancy expressed that they had dominantly not been living in a stable relationship, and pregnancy was only a barring 'accident', which they were unable to terminate it, or such was the disapproval of their environment that they still decided to continue pregnancy.

4.3.2.2. Postnatal sample

The percentage of those pregnant women who planned the pregnancy was 83.4% in the postnatal examination, and those who gave birth to an unplanned baby represented 14.7%, whereas the percentage of unwanted pregnancy was 1.9%. The data suggest strikingly that those women who planned their pregnancy were more willing to participate in the examination at 6 weeks postnatal then those in the other two groups ($p < 0.001$) (Table 9).

Table 9: Planning of pregnancy and the EPDS scores (postnatal sample)

	Rate	EPDS mean
Planned	83.40%	5 scores
Unplanned	14.70%	7.4 scores
Unwanted	1.90%	7.6 scores

EPDS=Edinburgh Postnatal Depression Scale

Mothers in the postnatal period are more apt to psychological fluctuation than in the antenatal phase. This is applicable in the case of those who planned the pregnancy, too. Those women who had planned to have baby reached lower scores on the EPDS. In contrast, those women who gave birth to a baby after an unplanned pregnancy can consider greater increase (7.4 scores), and those who had an unwanted pregnancy produced an even greater rise (7.6 scores).

4.3.3. Correlation between educational level and EPDS

4.3.3.1. Antenatal sample

46.1% of the pregnant women involved in the study finished higher education, while 47.1% of them attended secondary school, and only a meagre percentage of the pregnant women completed only primary education. As far as the average EPDS score

is concerned, women holding degrees were characterised by lower average scores (3.87) than those who pursued secondary education (5.08 scores), whereas the increase of those with basic education was even more significant (7.53 scores) (p<0.001) (Table 10).

Table 10: Level of education and EPDS scores (antenatal sample)

	Rate	EPDS mean
Tertiary	46.10%	3.87 scores
Secondary	47.10%	5.08 scores
Primary	6.80%	7.53 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.3.2. Postnatal sample

The same tendency prevailed six weeks after the childbirth from the aspect of educational level as we experienced in the case of planned pregnancy. Women having higher educational level were more willing to take part in the study, whereas those women having completed primary education returned only in meagre number to undergo the psychological screening 6 weeks after childbirth. More than half of the postnatal sample attended higher education (58.65%), 39.47% secondary education and only a small proportion had finished exclusively primary school (1.88%).

The correlation between educational level and EPDS scores is inversely proportional as opposed to the antenatal sample. Women having completed higher education reached higher average score (5.56), those ones who finished secondary education produced 5.1 scores, while women having completed primary level of education reached 4.6 scores (insignificant p=0.068) (Table 11).

Table 11: Level of education and the EPDS scores (postnatal sample)

	Rate	EPDS mean
Tertiary	58.65%	5.56 scores
Secondary	39.47%	5.1 scores
Primary	1.88%	4.6 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.4. Correlation between parity and EPDS

4.3.4.1. Antenatal sample

56.2% of the antenatal group were pregnant for the first time, while the percentage of multiparas was 43.8%. The trend of EPDS scores did not indicate significant distinction between the two groups (4.66. and 5.23 scores) (Table 12).

Table 12: Parity and the EPDS scores (antenatal sample)

	Rate	EPDS mean
Primipara	56.20%	4.66 scores
Multipara	43.80%	4.73 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.4.2. Postnatal sample

62% of the study subjects participating in the examination gave birth to their first baby, and 38% delivered the second (or more) child.

The EPDS scores were produced right the other way round as in the antenatal period. Primiparous women reached the highest scores here, although significant difference could not be detected (5.4 and 5.23 scores) (Table 13).

Table 13: Parity and the EPDS scores (postnatal sample)

	Rate	EPDS mean
Primipara	62.00%	5.4 scores
Multipara	38.00%	5.23 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.5. Correlation between financial status and EPDS

4.3.5.1. Antenatal sample

Study subjects had the opportunity to declare their financial status during the course of recording socio-demographic data. They could indicate in this survey section whether they had financial problems or not. 32 people of the 219 study subjects – which are 14.6% – answered yes this question. The influence of financial status on the psychological condition can be detected on EPDS scores as well. While the average EPDS scores of those women who had financial problems were a lot higher (6.87 scores) than those without this kind of problem (4.37 scores), therefore the prevalence of depressive symptoms are strongly connected to financial status (p=0.001) (Table 14).

Table 14: Financial status and EPDS scores (antenatal sample)

	Rate	EPDS mean
Financial problems	14.60%	6.87 scores
No financial problems	85.40%	4.37 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.5.2. Postnatal sample

It is striking in the postnatal sample that a greater degree of subjects admitted to have financial difficulties. 69 of the 266 study subjects ticked the box for financial problem, which represents 26% of the inquired population. The average EPDS score of the latter group is significantly higher than those not having financial problems (p=0.001) (Table 15).

Table 15: Financial status and the EPDS scores (postnatal sample)

	Rate	EPDS mean
Financial problems	26.00%	6.68 scores
No financial problem	74.00%	4.94 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.6. The trend of EPDS scores according to age

4.3.6.1. Antenatal sample

Average age of our study involving 219 people is 30 years, and the average EPDS score is 4.7. We could create the following 5 age groups: the first group consists of the under-twenties (7 people), the second consists of women from 21 to 25 years (30 people), the third group's range is between 26 and 30 (77 people), the fourth ranges between 31 and 35 (84 people), and the fifth group consists of women over 36 years of age (20 people). The average EPDS scores were the following: the two youngest categories appear to be the most sensitive to psychological changes, as their average EPDS scores are the highest ones (6.85 and 5.53 scores). Our results suggest that psychological reactions are the most favourable in the age ranging between 31 and 35 years (4.44 scores) (Table 16).

Table 16: Age and the EPDS scores (antenatal sample)

Mean Age	30 years	4,7 scores
	Number of persons	EPDS mean
≥20 years	7	6.85 scores
21-25 years	30	5.53 scores
26-30 years	77	4.94 scores
31-35 years	84	4.44 scores
<35 years	20	4.85 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.6.2. Postnatal sample

We followed the same method of categorisation in this study group as in the case of antenatal study subjects. The age distribution and average EPDS scores were as follows: the vulnerabilities of the two youngest categories can be traced in the postnatal period too (5 and 5.77 scores), but the protective effect of age over 35 years against psychological changes can be detected in this sample (4.76 scores) (Table 17).

Table 17: Age and the EPDS scores (postnatal sample)

Mean Age	30.5 years	5.36 scores
	Number of persons	EPDS mean
≥20 years	4	5 scores
21-25 years	31	5.77 scores
26-30 years	103	4.99 scores
31-35 years	82	5.39 scores
<35 years	34	4.76 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.7. Correlation between EPDS and the number of children

4.3.7.1. Antenatal sample

Among the study subjects 136 of the 219 were primiparas, 58 women were expecting a second child, the third child was being expected in 18 families, and 7 subjects were expecting the fourth or more child. Their average EPDS scores were as follows: expecting the fourth child increases the number of depressive symptoms remarkably

(6.85), whereas that of a second child appear to be the most ideal in terms of mental status (3.98) (Table 18).

Table 18: Number of children and the EPDS scores (antenatal sample)

	Number of persons	EPDS mean
Primipara	136	4.64 scores
2.child	58	3.98 scores
3.child	18	4.55 scores
< 4. child	7	6.85 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.7.2. Postnatal sample

In this study group the number of children and average EPDS scores concluded the following result: expecting the fourth baby is also represented by an increasing prevalence of depressive symptoms in the postnatal samples too (6.5), however the birth of a third baby appears to be the less vulnerable factor here (5.09) (Table 19).

Table 19: Number of children and the EPDS scores (postnatal sample)

	Number of persons	EPDS mean
Primipara	165	5.43 scores
2.child	74	5.2 scores
3.gchild	21	5.09 scores
< 4. child	6	6.5 scores

EPDS=Edinburgh Postnatal Depression Scale

4.3.8. Correlation between mode of delivery and EPDS

235 of the 266 postpartum study subjects were interviewed about the mode of delivery they had undergone. They could have chosen between two options: vaginal birth and caesarean section. 168 women gave birth by vaginal birth, while caesarean section was applied in 67 cases (28.5%). With respect to the EPDS scores those women who gave birth to the baby by caesarean section produced higher points six weeks after the delivery (5.98), whereas those who delivered their babies by natural birth reached lower scores in the same period (5.2) (p=0.115) (Table 20).

Table 20: The mode of delivery and the EPDS scores (postnatal sample)

	Rate	EPDS mean
Vaginal birth	71.50%	5.2 scores
Sectio caesarea	28.50%	5.98 scores

EPDS=Edinburgh Postnatal Depression Scale

5. Discussion

5.1. EPDS and perinatal depression

A significant amount of studies are focusing on perinatal psychology in the international context, moreover, the amount of Hungarian publications likewise presents an increasing tendency.

Psychosomatic approach has been prevailing in more and more countries since the establishment of the ISPOG (International Society of Psychosomatic Obstetrics and Gynaecology): 18 national societies have joined by now, including the Hungarian MAPSZIG (Magyar Pszichoszomatikus Szülészeti-Nőgyógyászati Társaság – Hungarian Society of Psychosomatic Obstetrics and Gynaecology) in 1992 [30].

The onset of major and minor depressions can coincide with both the pregnancy and postnatal periods. Its symptomatology does not differ from that of a depression irrespective of the perinatal period. The prevalence and risk factors of antenatal depression have been less investigated, as the majority of studies have focused on mood disorders of the postnatal period [29]. The prevalence of major and minor antenatal depression jointly is generally the same as that of the postnatal depression, ranging between 3% and 25%, according to the meta-analysis performed by Gibson [29]. The most likely time range for the onset of PND symptoms is 6 to 12 weeks after childbirth. Prevalence of AND and PND in different studies depends on which screening test or diagnostic interview has been applied to identify depressive symptoms [29]. The application of a diagnostic interview requires great expertise, moreover, it is money and time consuming, therefore researchers have preferred screening tests, even if these can only be applied for screening purposes and are not adequate for diagnoses. Good screening tests have relatively high sensitivity and specificity.

The first significant Hungarian research applying EPDS was conducted at the Department of Obstetrics and Gynaecology University of Debrecen [9]. They

investigated the mental state of 725 postnatal women three days after childbirth, and subsequently 3 to 9 months after it among 165 randomly selected women. This study indicates that 29.8% of the women in puerperium were suffering from depressed mood on the 3rd day of the postnatal period [9].

Although EPDS has already been validated for the postnatal period in several countries worldwide, only a few papers are available on its antenatal validation, in spite of the fact that different cut-off scores should be applied in case of antenatal and postnatal examinations. Our study has proved that EPDS is just as appropriate for the screening of different mood disorders in the antenatal as in the postnatal period.

5.2.Discussion of antenatal findings

Although the Edinburg Postnatal Depression Scale (EPDS) has been validated in over 30 countries, it has only been validated in some countries for screening for depression during pregnancy [29,31,32,33,34,35]. It is of particular note that the antenatal cut-off values have been found to be different from the postnatal ones.

We have demonstrated that the Hungarian version of the EPDS shows promise as a screening tool [10]. Its psychometric properties for screening for antenatal depression (APD), however, require further investigation in a more representative sample. The EPDS has been recently validated in a Hungarian, nationally representative sample [36], however, the authors used the Beck Depression Inventory (BDI) rather than a clinical interview based on DSM-IV criteria for diagnosis in the postnatal period. Their study found a 10.9% prevalence of PPD with the BDI in Hungary, and using a cut-off score of 13 on the EPDS, they found similar sensitivity and specificity values to those in our study [10].

The cut-off scores in our study seemed very low compared to other studies validating the EPDS in the antenatal period [31, 32, 33, 34, 35]. The only validation study that reported a comparable threshold (8/9) was performed in India in a postnatal sample [37]. The optimal cut-off for major depression in previous antenatal studies looking at a similar time period of the pregnancy varied from 10/11 [38] to 12/13 [31], and for combined depression there is only one study [34] reporting a cut-off 13/14 at any time point during pregnancy (mean of 18 weeks of gestation). Studies looking at later stages of pregnancy yielded lower cut-offs; 9/10 points for major depression in the third trimester [38].

In summary, it is important to note that various validation studies used different diagnostic criteria and interview schedules for diagnosing depression, in study samples rather different from one another, and at different times during pregnancy. The Bergink study was the only one that looked at a community sample from the general population, testing pregnant woman three times, once in each trimester [38]. In our study, we looked at EPDS scores at 12 weeks, because this was the time when it was the most practicable for us to approach pregnant woman. [10]. In order to get a more comprehensive picture of the behaviour of the EPDS in pregnant woman, it would be necessary also to collect data at weeks 24 and 36.

The reason for the low cut-off score in our study is likely to be multi-factorial and would deserve further study. EPDS validations seemed to work well in some cultures, e.g. the UK, Lithuania, Malta, or Nigeria, while not so well in some others, such as Tailand or Turkey, because of the result of low sensitivity and specificity. Even if we consider our translation as more or less conveying the same meaning as the original questionnaire, cultural differences (differences in illness behaviour, etc.) are likely to play a major role. We suspect that cultural factors play a significant role in both symptom presentation and reporting [29]. According to Lee at al. [17], the classification of depression into minor and major forms may also be riddled by cultural differences, as somatic symptoms are expressed differently and to different degrees in various ethnic groups. We suspect, although we cannot substantiate this from this study, Hungarian women complain more about somatic (as opposed to subjective mood or cognitive) aspects of depression.

Although, overall, the performance of the Hungarian version of the EPDS was only moderate, our study proved that the Hungarian version of the EPDS is able to detect AND (major and minor depression combined) with above 80% sensitivity and specificity [10].

In Hungary, the point prevalence of major depressive disorder (MDD) in the general population is 4.7% (8/172) [39], whereas in our sample of pregnant women it was 3.2% (7/219). In contrast with other studies, which asserted that pregnancy has no protective effect on AND or even a definite increase in the prevalence of MDD during pregnancy [40,41,42], in our sample a hint of a decrease in the rate of MDD can be observed during pregnancy as compared to the general population. Studies looking at the prevalence of MDD in women before pregnancy, during pregnancy and postnatal have been riddled with various methodological problems; as far as we are aware, no

prospective study using different versions of a diagnostic instrument appropriately adapted for the above periods has been published.

Major depression cases tend to fall above a cut-off of 8/9 points on the Hungarian version of the EPDS. However, there is a significant scatter in the scores and the distributions show a clear overlap between minor and major depression and non-depressed woman as measured by the EPDS. In general, the EPDS does not appear to be great for screening for antenatal minor depression, but its screening acceptable for combined depression (recommendable for screening purposes) or for major depression.

Setting a cut-off of 6/7 is ideal for classifying combined depression cases (100% of the cases with major depression being identified), but at that cut-off almost 21% will be incorrectly flagged up as potentially depressed. At the higher cut-off point of 8/9 the sensitivity (71.4%), specificity (91.5%), and PPV (21.7%) for major depression remains acceptable, and therefore we suggest using this higher cut-off for major depression.

Taken together, in our opinion, an EPDS total score above 6 points could be used for screening for any type of depression (minor and major), whereas a score of 9 or higher for major depression in antenatal women [10].

We found the behaviour of the EPDS typical in the ROC analyses. It was unsurprising that the EPDS was better at identifying major (as opposed to minor) depression, as there are fewer major depression cases and for major depression the patient has to have more marked symptoms.

The criterion validity of the EPDS as a screening instrument for depression according to DSM-IV diagnostic interview as the criterion standard is respectable. Semantic and content validity of the EPDS were found acceptable for the Hungarian population. We found the psychometric characteristics of the EPDS generally satisfactory.

In summary, the Hungarian version of the EPDS proved to be an acceptable, reliable and valid antenatal screening instrument [10].

5.3.Discussion of postnatal findings

We have demonstrated that EPDS has good screening properties for combined depression or to identify major depression cases in Hungary as well. Most studies

validated the EPDS for use in major depression, and the cut-off value we identified in our study as optimal for major depression falls within the range recommended by these earlier studies (9-12/13 points) [29]. Besides cultural differences, the timing of testing and the characteristics of the sample (e.g. clinical or nationally representative) also have an influence on cut-off values [29].

Both the Spanish end the Norwegian validation studies established the cut-off values for major depression as well as combined depression (major and minor depression together) [14,43]. Inevitably, lowering the cut-off value to detect combined depression leads to an increase in the rate of false positives, and our cut-off point (7/8) indeed appears very low in comparison [29].

The EPDS has been recently validated in a nationally representative sample in Hungary [36]. Their study found a prevalence of 10.8% for moderate or severe depressive symptomatology with the BDI in Hungary, and recommended a cut-off score of 13/14 on the EPDS for caseness. This prevalence value would be too high for major depression and is closer to what we found in our study for combined depression (16.5 %).

The two studies, though trying to measure the same illness, are not comparable, because the BDI score ranges do not map onto the SCID minor and major depression diagnoses. Our cut-off of 12/13 for detecting major depression detected 5.26% of the sample as likely suffering from major depression and the cut-off of 7/8 indicate 23.68% for combined depression, with the 10.81% detected in the Nagy et al study falling between our values [36].

In a review of validation studies, Gibson found that the optimal cut-off value was between 8/9 and 12/13 [29]. Our Hungarian version of the EPDS has a good range of sensitivities and specificities for major depression in this range, and its performance is also acceptable for combined depression at a lower cut-off. Not every adaptation managed to produce sensitivity and specificity values similar to the original version. For example, the Norwegian [43], Spanish [14], and Malaysian [44] validation studies reported less ideal values.

The scale appears effective for both clinical screening (using a cut-off of 7/8, resulting in high sensitivity) and research purposes (using a cut-off of 12/13, providing high specificity), similarly to the Spanish and Norwegian versions [14,43].

As a result of our study, a Hungarian version of the EPDS validated in both the ante- and postpartum period has now become available. Although the global screening

performance of the scale is not significantly different in the ante- relative to the postnatal period, the Hungarian EPDS seems to perform better in the postnatal period.

5.4.Assessment of psychosocial factors

The average EPDS score in our antenatal examination was 4.69, while that of the postnatal was 5.37 (p=0.046). Putting these results in a national and international context, we could declare the following: the average EPDS score in the eastern Hungarian research of Török et al. was 8.12 [9]. The most important reason for this significant difference might be that Török et al. have conducted their postnatal study 3 days after delivery, which is regarded as a very sensitive period concerning postpartum blues [9]. The prevalence of lethargy ranges between 50 and 80% in those days. In contrast, the subjects in our study were all 6 weeks after childbirth, thus they had already been over their postpartum depressed mood. Symptoms of a possible postpartum depression had already appeared by this time however their prevalence ranges only between 10% and 20%. The significant difference between the results of the two studies can be explained by this among all.

In an international context, if we take our average postnatal scores (5.37) into account, our results are located in the mid-range of the available studies. Lower average scores have only be found in France (4.1), Norway (4.3) and Sweden (4.9) among the studies available. The highest average scores have been in England (7.4) USA (7.98) and Korea (8.64) [45].

Naturally, far-reaching conclusions should not be drawn until the studies' postnatal chronology has been harmonised. Various explanations for the differences can be given: cultural, financial and social differences among countries, or even among regions of one country, the nations' psychological condition, reconciliation strategies, etc.

5.4.1. Place of residence and EPDS

Results indicate transparently that urban population is less affected psychologically by pregnancy than women residing in villages and farmsteads. There are several reasons for this phenomenon. Maternity care is a process implying fairly many examinations and screenings performed on mostly healthy women , that are more easily accessible

to urban residents, thus for them these are less money and time consuming procedures than for those who have to travel from villages or rural areas. Other pregnancy-related services, such as pregnancy exercise, birthing class, scientific lectures can be more easily accessible to pregnant woman with urban residence than those living out of town. It is possible that an urban resident who works in the nearby regulates her civil life and stops working later, as opposed to a pregnant woman residing in the country commuting everyday, who is forced to suspend normal life earlier in her pregnancy.

Due to the abovementioned it is well understandable why we got higher EPDS scores in the case of those living in the country.

Our results revealed an inversely proportionate ratio in the postnatal sample in contrast to the antenatal study. While urban residents could better endure pregnancy psychologically, the period after childbirth is more burdensome to them.

It is possible that introverted postnatal phase, narrower space and time and temporarily less stimuli from the environment are more bearable for women living in the country, since they could have already got accustomed to that more tranquil way of life either during the course of pregnancy or before it.

Nevertheless it has been proved in both cases that woman in postnatal period are more sensitive to psychological changes, since in case of both urban and rural populations the average EPDS scores were remarkably higher than those in the antenatal period.

Török et al. did not reveal significant distinctions in their sample regarding the place of residence, however, their study, which was conducted on women in the postnatal period, indicates higher average EPDS scores among women residing out of town. They explained this result, among all, by higher unemployment rate and worse financial status among the rural population affecting the presence of depressive symptoms [9].

5.4.2. Planning of pregnancy and EPDS

The average EPDS score was 4.36, 6 and 7.9 in the case of planned, unplanned and unwanted pregnancies, respectively. This tendency speaks for itself: if the conception is the result of a conscious decision, backed by a reliable relationship, pregnancy is psychologically less distressing for the pregnant woman. But if a couple has not planned the pregnancy and timing is inconvenient for them, it increases the presence of anxiety and symptoms of depression during pregnancy. Furthermore, carrying an

unwanted pregnancy brings about an even more drastic deterioration of psychological status. Our results confirm that the more conscious the decision on having a baby is, the less possible is that antenatal period brings about psychological changes.

Woman in postnatal period are more sensitive to mood disorders. If a woman has not planned or wanted the pregnancy, but still continues carrying it, she is more apt to suffer from depressive symptoms, since she has not been prepared for expecting, caring for and handling a baby. This preparation is not easy even if pregnancy is the result of a conscious decision, thus the absence of it can evoke social and psychological alterations.

In our 2009 study we followed the course of pregnancy and the postnatal period by means of questionnaires focusing on anxiety and depression [46]. Symptoms of anxiety intensified to a greater degree during the course of pregnancy in case of unplanned pregnancies than in the case of planned pregnancies.

We studied the health conditions of 1729 pregnant women using Leverton Questionnaire (LQ) on a southeastern Hungarian sample in 2006-2007 [47]. 17.2% of this sample showed depressive symptoms. The study subjects were in 14 to 24 gestational weeks. Greater proportion of women not carrying a planned pregnancy suffered from symptoms of depression than that of the control group (31.2% versus 22.1%, respectively). Our study made it clear that both family support and secure relationship significantly contribute to healthy mental state during pregnancy.

5.4.3. Educational level and EPDS

Our antenatal results may suggest that higher educational level protects from psychological disorders, and anxiety during pregnancy, since the higher it was the smaller EPDS scores were attained in our sample.

Comparing the average ante- and postnatal EPDS scores, we found differences among women with different educational levels. The number of women who completed only the primary level of education (eight years) is meagre in the sample, which can conclude a greater decrease in scores. Nevertheless, while the scores reached by those completing secondary level of education have altered only slightly between the antenatal and postnatal periods, the postnatal onset of symptoms of anxiety and depression in graduate women is striking. We may presume that the highest possible

educational level provides protection only in the antenatal period, whereas the postnatal period brings about more significant psychological alterations for them.

The explanation can be that it is more difficult to cope with being away from work and interrupting career for women having completed higher qualification and the sense of closure and unsociability of the postnatal and especially the puerperal period place a greater burden on highly educated women's mood.

The research of Török et al. found low educational level to be an unequivocally provoking factor of depression in the postnatal phase, which coincides with Kopp's research conclusions, namely that educational level represents one of the most important indicators of depression's frequency and severity in the general population [5], and hence higher educational level is considered to play a role in health protection [9].

5.4.4. Parity and EPDS

Only slight difference can be detected between the average EPDS score of primiparas and multiparas. According to our results, multiparas have to face more psychological challenges than first-time pregnant women, which can have several reasons. Those women who have already had a child have less time and opportunity to focus their attention on their present pregnancy. They are more busy; access to examinations, screenings require great efforts, moreover if there was a complication during the previous pregnancy or delivery, it can also distress present pregnancy. On the contrary, primiparas can draw almost all their attention to the pregnancy; a still unknown event is in progress, and thence they manage with less anxiety, and are more likely to experience their own pregnancy as a miracle.

We could detect higher average EPDS score in both cases in relation to the antenatal study's results (however, it is important to repeat that we did not the same study subjects in the ante- and postnatal studies). Higher postnatal scores of first-time pregnant women could be explained by their postnatal tasks (breastfeeding, too many late nights, hormonal changes, possible c-section and perineal pains, etc.) experienced for the first time, whereas multiparas have already undergone these procedures at least once.

We followed southeastern Hungarian 46 pregnant women with regard to their psychological health state in the antenatal and postnatal periods in 2009 [46]. In this study, women expecting not the first baby experienced substantially stronger anxiety

and depression throughout the course of pregnancy, moreover, depressive symptoms occurred more intensively likewise after childbirth than in primiparas. Anxiety intensifies towards the end of regardless of parity. The same tendency is observed concerning symptoms of depression. As our antenatal and postnatal studies were conducted on the same sample, we can state that antenatal depression unequivocally anticipates the possibility of developing postnatal mood disorders. Scores obtained from the two different periods indicate strong correlation (r=0.63).

5.4.5. Financial status and EPDS

Higher tendency of our postnatal sample's average EPDS score can be explained by the following: in general, pregnant women are still at work during gestational period (particularly in the first trimester when our survey took place), and they do not have to spend any money on their foetus at that time. As opposed to the postnatal phase when a mother only receives Childcare Fee or Childcare Allowance, and childcare anyway demands more financial support. Therefore this period is regarded as more money consuming than the abovementioned antenatal phase.

Similar results were produced by Török et al., who likewise correlated unfavourable financial status with the prevalence of the symptom complex of depression. Moreover, they added that if bad financial state is accompanied by unemployment status, the possibility of the depressive symptoms' prevalence is almost doubles [9].

5.4.6. Age and EPDS

Results suggest that 31-35 age range of a pregnant woman is the most protective factor against psychological effects, which is followed by the age group over 35 years. This can be interpreted by the fact that this generation is characterised by greater existential security, than younger groups; the maternity dominantly takes place in marriage or stable relationship, furthermore, adult identity can be converted to parental identity in an easier way.

It can be detected from the results that the age over 35 years has protective influence against the postnatal mood disorders, in contrast to the thesis of Zsuzsa Török, where the percentage of pathologies measured by EPDS is remarkably higher in the age

group 35+ (37%) [9]. Lower age groups are, in contrast, regarded as endangered in the postnatal period in our study, too. This fact can also be interpreted by what we experienced in the antenatal phase: adult identity, secure relationship and existential security decrease the possibility of the occurrence of mood disorders in the postnatal phase.

There are research results reflecting that a mother's age ranging between 35 and 39 has expressly protective effect against mood disorders [48]. Török et al. could not find significant distinction in their study focusing on age, but noticed that the too young or too old age of the mother is a provoking factor in higher EPDS scores. We strongly suggest hereafter, as there is a tendency to postpone childbearing, that this stratum should be considered a risk group [9].

5.4.7. EPDS and number of children

Primiparas and those women who were pregnant with their fourth (or more) child produced the highest scores in the EPDS questionnaire. Women in their second pregnancy reached substantially lower scores, meaning that this is the group which is psychologically less sensitive in the first trimester.

Primiparas and women in their fourth (or more) pregnancy are characterised by depressed mood in particular, whereas women expecting their second and third baby can cope with the situation discernibly better. Greater level of anxiety in primiparas can be explained by that a still inexperienced process is in progress, which can raise their distress: pregnancy and subsequently tasks in connection with childcare represent new challenges, which is not always easy to cope with. Women being pregnant with their second or third baby already deal with these issues as routines; these things are not as burdensome as in the case of primiparas.

Several studies have already proved that a mother's mood condition is remarkably influenced by which child in the row she is pregnant with. Numerous studies revealed that primiparity inclines permanent depression [49,50]. In the study of Török et al. the highest average EPDS score consisting of pathology was produced by those women who were expecting their fourth baby (47.4%), followed by the primiparas in the row (30.7%). The most favourable average EPDS scores were produced by women with their third pregnancies, similarly to our research results [9].

5.4.8. Mode of delivery and EPDS

Results have revealed that caesarean section influences postnatal mood disorders as a risk factor; it has effects on the mother's mood even six weeks after childbirth.

Several international and Hungarian researches mention that circumstances of the childbirth are key factors in the mother's subsequent mood state. Caesarean section is regarded as a risk factor, and there is a greater possibility of depressed mood if labour pain and childbirth happen at night; moreover, premature birth is also a factor that can increase risk [9,24]. In contrast, some studies declared that elective caesarean section have no influence on the mother's further mood condition [24].

Török et al. detected significantly higher average EPDS score in surveys recorded after a caesarean section or vacuum extraction then in the case of vaginal birth. They interpret their result with that caesarean section causes the loss of control, reduction in self-respect and feelings of guilt to the mother, which are more likely to lead to depressed mood [9].

6. Conclusions

Our **primary objective** was to provide a screening tool for southeastern Hungarian experts by means of antenatal and postnatal validation of EPDS. Using this tool, pregnant and puerperal women suffering from mood disorders can be screened. As our validation process verified the reliability of EPDS we can certainly state that the questionnaire is suitable for screening the perinatal population in southeastern Hungary, both in antenatal and postnatal periods.

We determined the EPDS cut-off value at 6/7 scores for combined depression in our antenatal study, with a sensitivity and specificity of ca. 80%. Furthermore, we asserted that for detection of major depression, we have to set the cut-off value above 9 scores. The same was justified by our ROC curve analysis, too. On the basis of our results we can consider the content and semantic validation processes of EPDS conducted on our clinical samples successful, and thence it can be reliably applied to screen depressive symptoms.

On the basis of our validation process conducted in the postnatal period, we recommend to use the questionnaire with cut-off score 7/8 for clinical screening, and cut-off score 12/13 for research purposes.

As the application is quick and easy, and the assessment is unequivocal, the screening tool can easily be applied even by non-psychologist health care workers. By this tool, either an obstetrician or an antenatal nurse can confirm suspected perinatal depressive symptoms in 3-5 minutes, and in case the result is over the cut-off level, appropriate measures of expertise can be offered.

Our secondary objective was to find out whether there is correlation between the change in mood condition and the various psychosocial factors. The study on pregnant women highlighted the contribution of the following psychosocial factors to the development of psychopathologies:

- residence in village or farmstead,
- carrying unplanned or unwanted pregnancy,
- low educational level,
- multiparity,
- poor financial condition,
- mother's age being under 20-25 years,
- having 4th (or more) pregnancy

We detected the following provoking factors in the postnatal sample:

- urban residence,
- carrying unplanned or unwanted pregnancy,
- high educational level,
- primiparity,
- struggling with financial difficulties,
- maternity under the ages of 20-25,
- having 4th (or more) pregnancy
- Caesarean section.

Considering all the aforementioned we can assert that unplanned or unwanted pregnancy, poor financial condition, the age under 20-25 years and having 4th (or more) pregnancy were all risk factors in the samples we studied both in the antenatal and postnatal periods.

Our **third objective** was to determine the proportion of women with psychopathologies in the southeastern Hungarian perinatal population. Our study revealed that almost every seventh pregnant woman, and every fourth among

woman in puerperium are affected by one of the aforementioned psychopathologies.

As a consequence of the obtained results it has become imminent that psychological screening will become part of maternity care.

7. **New statements and practical consequences of the study**

Results of our study call the attention of experts on the fact that there is a stratum in the perinatal population who suffers from severe mood disorders during and after pregnancy. As, there was no complex research focusing on this field in southeastern Hungary earlier, and psychological aid had not been available for women affected by symptoms of minor or combined depression before 2009, we inevitably have to conclude on the grounds of our study that pregnant and puerperal women suffering from psychological symptoms have to be addressed somehow, and given specific aid by means of psychoeducational measures.

7.1. Introduction of psychological screening in the maternity care in Szeged

Considering all the aforementioned the Department of Obstetrics and Gynaecology, University of Szeged introduced the psychological screening of pregnant women in all three trimesters and in the postnatal phase as a new process in 1th April, 2011. Since then it has been conducted by antenatal nurses using the EPDS.

Antenatal nurses are authorised to apply EPDS questionnaire. The Professional College of Antenatal Nurses articulated the following in the 7th issue of Official Health Gazette: 'The professional protocol of the Ministry of National Resources about the psychological changes in the postnatal period, the role, potentials and competence of antenatal nurses in recognising perinatal mood disorders are as follows:

By means of adequate screening, observation of the mother's psychological condition, application of questionnaire (EPDS, STAI) anxiety and mood disorders can be recognised in due time, and for aid, treatment the mother can be further directed to […] the antenatal nurses integrates scores of a standard questionnaire that has been completed on the occasion of family visit into her experience and knowledge obtained

during maternity care, which enable her to forward care recipients to special care if necessary. Completed questionnaires (EPDS, STAI) form part of the medical documentation […] Recognition and treatment of mood disorders following birth require multidisciplinary and multisectorial cooperation.'

In case antenatal nurse encounters a result above the limit value (8 or more scores) refers the pregnant women to Department of Obstetrics and Gynaecology, University of Szeged for further psychological screening. After making an appointment, the pregnant or puerperal woman undergoes a more complex psychological screening (EPDS, SCID, GHQ), and subsequently she is provided with specific psychological advice in order to alleviate her symptoms and decrease her anxiety. In case psychiatric intervention is required, the patient is directed to a specialist medical care in the Department of Psychiatry, University of Szeged.

We expect the introduction of screening to recognise pathologic mood alterations in their initial phases, and to provide special aid for patients as soon as possible. As a consequence, several unwanted impacts that can be unfavourable to the mother and the foetus or the newborn baby will be avoidable, e.g. intrauterine foetal growth retardation, premature birth, caesarean section, or postpartum lethargy and depression, inadequate cognitive and somatic development of the baby, and damage to the mother-baby bond.

It is a common aim for experts working in obstetrics to consider patients with respect to psychosomatics; in order to, becoming able to perceive the initial symptoms they have to be able to develop trustful relationship with their patients. Naturally, supportive role of family is very important, as being the first to notice the initial signs of possible psychological origin they can persuade the women to turn to a specialist.

7.2. Further suggestions in the field of maternity care

In this study, we detected psychopathological alterations in every seventh pregnant woman, and every fourth postnatal mother, be that either depression, or any type of the anxiety. With respect to these, psychological screening in Hungary should be considered to be a part of maternity care, and integrated into the array of routine screenings that consists of examinations such as blood glucose monitoring, blood

pressure control, ultrasound diagnostics, etc. An indispensable condition of this is, that psychological consultancy should be available in obstetric departments and maternity care institutions, in order to be able to receive and treat screened and detected patients with psychopathology which could improve the quality of medical care through maternity care activity.

Acknowledgements

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Appendix

Appendix 1.

Socio-demographic data

Present date: year: .... month: .... day:....

Date of terminus / Date of delivery (year, month, day): ....

Age: _____years

Type of residence:

□ Szeged   □ Village

□ Other town   □ Outlying area

Marital status:

□ Married   □ Divorced and cohabitant

□ Cohabitant   □ Divorced (single)

□ Single

Level of education:

□ Primary

□ Secondary

□ Tertiary

Number of children: ......   Number of spontaneous abortion: ......

Number of abortion: ......

□ Planned pregnancy   □ Unplanned pregnancy

□ Unwanted pregnancy

Stressful event in the last year

□ Divorce   □ Problems in marriage or with partner

                                                     □ Problems at workplace

□ Financial problems   □ Illness

□ Illness of a relative   □ Accident

□ Death of a relative   □ Other:

_____

Do you have any psychiatric problem? Are you under medical treatment? Diagnosis of your mental disorder:

_____

_____

What kind of medicament do you take?:

_____

_____

Have you ever had any mental disorder? Name of this mental disorder:

_____

_____

What kind of medicament did you take?:

_____

_____

Appendix 2.

The Hungarian version of Edinburgh Postnatal Depression Scale (EPDS)

Mivel Ön terhes, vagy mostanában született gyermeke, azt szeretnénk megtudni, hogyan érzi magát. Kérem, jelölje be azokat a válaszokat, amelyek a legközelebb álltak ahhoz, ahogy Ön érezte magát **az elmúlt 7 napban (**és nem csak jelenleg).

Tehát az elmúlt 7 napban…

1. Képes voltam nevetni és a dolgok mulatságos oldalát nézni.
Ugyanolyan gyakran, mint korábban
Talán kicsit ritkábban
Egyértelműen ritkábban
Egyáltalán nem

2. Örömmel vártam bizonyos dolgokat.
Ugyanúgy, mint régen
Talán kicsit ritkábban
Egyértelműen ritkábban
Egyáltalán nem

3. Feleslegesen hibáztattam magam, amikor a dolgok rosszul mentek.
Többnyire igen
Elég gyakran
Nem túl gyakran
Soha

4. Minden különösebb ok nélkül szorongóvá, aggodalmassá váltam.
Soha
Kivételes esetekben
Több alkalommal
Nagyon gyakran

5. Minden különösebb ok nélkül félelem vagy pánik tört rám.
Nagyon gyakran
Több alkalommal
Kivételes esetekben
Soha

6. Összecsaptak fejem fölött a hullámok.
Igen, többnyire nem tudtam megbirkózni a dolgokkal.
Igen, néha nem tudok oly mértékben megbirkózni azokkal, mint korábban.
Nem, többnyire jól elboldogulok azokkal.
Nem, ugyanolyan jól megbirkózom azokkal, mint korábban.

7. Olyan boldogtalan voltam, hogy problémám volt az alvással.
Többnyire igen

Több alkalommal
Csak ritkán
Soha nem fordult elő

8. Szomorúnak vagy szerencsétlennek éreztem magam.
Többnyire igen
Elég gyakran
Csak ritkán
Soha nem fordult elő

9. Annyira boldogtalannak éreztem magam, hogy sírva fakadtam.
Igen, legtöbbször
Igen, elég gyakran
Csak ritkán
Soha nem fordult elő

10. Eszembe jutott már, hogy kárt teszek magamban.
Elég gyakran
Néha
Szinte soha
Soha

Publications

59

I.