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Dysfunction of the hypothalamo-pituitary-adrenal axis in adolescents after a suicide attempt

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Summary

Background and aim: *The objective of this research was to find out whether there is a relation between the observed suicidal behaviours, mental disorders and dysfunction of the hypothalamo–pituitary–adrenal axis.* ***Material and method:*** *Two populations were subject of the research: 84 adolescents aged 14–21, after suicide attempts (ASA – drug overdose), never treated psychiatrically, and 30 adolescents after accidental intoxication (ACI). In each patient the serum levels of cortisol and ACTH were assessed, and the Dexamethasone Suppression Test (DST) was made.* ***Results:*** *Most patients in the ASA group were females. In this group statistically higher levels of cortisol after DST were found, as compared to the ACI group. Considering the patients' sex, the differences of serum cortisol levels were significant only in females. We found that higher cortisol levels in ASA were related to diagnosed depressive disorders (mostly in females), presence of psychosocial and environmental problems, and elevated risk of repeated suicide attempt.* ***Conclusion:*** *In the examined group of 84 adolescents after suicidal poisonings a statistically significantly higher serum cortisol levels after dexamethasone were found, as compared to the control group composed of 30 accidentally intoxicated adolescents.*

Key words: suicide, adolescents, cortisol, and dexamethasone suppression test

Introduction

The first empirical studies on suicides involved a sociological approach. At the beginning of the 1970-ies, the biological (mainly biochemical) dimension appeared [1]. Hormonal disorders have long been known to be strictly correlated with moodiness and vice versa [2, 3]; e.g. in the Cushing syndrome various mental disorders, mainly emotional factors, are described [4]. On the other hand, the emotional status is controlled by the limbic system, which in turn is connected with the hypothalamus – the essential locus of internal secretion. In humans, mediating in physiological response to stress is, among others, the limbic-hypothalamo-pituitary-adrenal axis (LHPA) and catecholamines. The hypothalamic neurohormone – corticoliberyn (CRF) enhances the pituitary secretion of corticotrophin (ACTH), beta-endorphin and melanotropine. Secretion of ACTH indicates the clear circadian rhythm (with a peak in the morning hours) and affects the cortisol secretion by adrenal cortex as the negative feedback. This

phenomenon can be evaluated with a dynamic test, i.e. the dexamethasone suppression test (DST) [3]. Dexamethasone (synthetic derivative of cortisol) at the 0.5-2 mg dose causes in healthy subjects the cortisol secretion suppression for 30-36 hours [5, 6]. More and more studies [6, 7, 8, 9, 10, 11] confirm the LHPA dysfunction in depression (indicated also by the modified test DST/CRF). Excessive secretion of cortisol occurs in approximately 50% of patients with major depression (MD), whereas in 50 – 70% of patients with MD after administration of dexamethasone no suppression of cortisol and ACTH secretion occurs, which is an abnormal/pathological result of DST – N DST (cortisol level in serum >5 μg/dl) [2]. The DST result is usually evaluated individually for each subject, and the studies compare the number (%) of N DST cases in the examined group with that of controls. Some authors also determine the mean cortisol levels in examined groups, which allows to indicate certain correlations and tendencies (e.g. correlation between the severity of a suicide attempt with the cortisol level in DST or the impact of achieved clinical improvement on the DST result) [11, 12, 13]. For evaluation of DST the authors of the study use the notions: sensitivity and specificity. The DST sensitivity is an index of N DST in the population affected by a certain disease/disorder, whereas the specificity – an index of the correct DST result in healthy population [6, 14]. An incorrect DST (N DST) result is found among others in: Cushing disease, diabetes, uraemia, cancer, infections, pregnancy, stressful reaction, after certain drugs and with the overweight [15, 16, 17, 18]. N DST may be also correlated with sex (higher percentage of N DST in female subjects) [19] and with the disease intensification and subjects' age [16, 20]. In psychiatry DST is primarily considered to be sensitive and diagnostic for MD [8, 11, 21, 22, 23, 24]. Yet, also in other mental disorders N DST is found to be more prevalent than in healthy subjects (in 4 – 10%) [2]. These disorders include: schizophrenia, obsessive-compulsive disorders, nutritive disorders, anxiety disorders with panic attacks, dementia, and post-traumatic stress disorders [13, 20, 21, 25].

Studies on neurobiological conditions in mental disorders in children and adolescents are limited and lag behind such studies in adults [14]. In infants and children, among others, changes in cortisol levels were found (in saliva, urine, and serum) under the effects of various stressors i.e.: intravenous injection, separation from mother, hospitalisation; these changes were 2-3 times more prevalent in female subjects. In certain publications [5, 14, 26], the cited authors confirm the usefulness of DST in the diagnosis of some developmental age disorders, mainly depressive, including suicidal behaviour. Sensitivity of DST in this period of life was evaluated as 22-87%, and the specificity – as 53-100% [5, 14].

However, some studies do not confirm any correlation between N DST and depressive disorders and/or suicidal behaviour in adolescents and adults [5, 18, 22, 27]. The authors of those studies rather point to the role of stressful situations in the pathogenesis of affective diseases and to significant contribution of stress to the dysfunction of the LHPA axis [5, 7, 21, 28, 29, 30, 31]. Furthermore, the correlations between the endocrine and the immunological systems (mainly immunosupressive effects of CRF through the autonomic sympathetic system) [30, 32, 33] and a correlation between hypercortisolemia with serotonin deficiency are considered [2, 6].

The studies evaluating the correlation between suicidal behaviour (SB) and the LHPA axis mainly refer to selected issues: 1/ violent SB vs. non-violent [34, 35, 36];

2/ single vs. multiple SB [10]; 3/ committed vs. attempted suicide [12]; 4/ personality dimensions [22, 37, 38]. Those studies are missing which would correlate the enhanced risk of repeated suicide attempt and LHPA axis dysfunction in adolescents.

Objective of the studies

The studies were aimed at evaluating the hypothalamo-pituitary-adrenal (HPA) axis, i.e. the blood level of ACTH and cortisol both before and after dexamethasone administration (DST) in adolescents who were not treated psychiatrically, who made a suicide attempt by intoxication, and searching for possible correlations between the cortisol level found in them before and after dexamethasone and: 1/ a psychiatric and psychological diagnosis, 2/ degree of suicidal risk, 3/ presence of stressors, 4/ activation of immunological system.

Material [1]

Within one calendar year (1998) two (the so called 'current') populations of adolescents were examined, i.e. adolescents aged 14 – 21, who stayed at the Clinic of Acute Poisonings, Institute of Occupational Medicine in Łódź, for suicidal or accidental intoxication. Only patients without deviations in physical examinations, not treated psychiatrically, who expressed their consent, in writing, to the proposed research procedures (previously confirmed by the Regional Committee of Research Ethics) were included into the studies. The examined group (N=84) was selected from the ("current") population of 112 adolescents after suicidal poisonings (ASA). Those not included into the studies (25%) were either discharged from hospital at their own request before the studies were completed, or were not eligible for the studies because of their health condition. Adolescents usually poisoned themselves with benzodiazepine drugs (bda - 16 persons), neuroleptics (14 persons), nonsteroid anti-inflammatory drugs (12 persons), herbal medicines (11 persons), and also with cardiac drugs (beta-blockers), antidepressants, alcohol, antihistaminic drugs, and in single cases with antibiotics, amphetamine, carbon monoxide (CO), lysol. The average age (+/- standard deviation – SD) in the ASA group was 17.8+/-1.7; for girls (N=59) it reached 17.4+/-1.7, for boys (N=25) – 18.6+/-1.3.

The control (comparative) group (N=30) was selected from the so-called 'current' population of 36 adolescents intoxicated accidentally (ACI), mostly with CO (15 persons) and mushrooms (4 persons). The further causes of poisoning were psychoactive drugs, including bda and herbal drugs, and in single cases: alcohol, nonsteroid anti-inflammatory drugs, lysol. The average age (+/- standard deviation – SD) in ACI group was 17.5+/-2.1; for girls (N=15) it reached 17.3+/-1.9; for boys (N=15) – 17.7+/-2.4. During evaluation of laboratory tests one subject from the ACI group was rejected because he was diagnosed with the Cushing syndrome.

[1] This material was already presented in earlier research on other aspects of suicidal behaviour.

A detailed sociological evaluation of compared (ASA and ACI) groups is presented in Table 1.

For the statistical analysis of data the computer programme Statystica Statsoft was applied. For immeasurable characteristics the Chi ^{2} test (possibly with Yates correction, for small groups) was applied. For measurable characteristics, if the data distribution was not normal, the nonparametrical Mann-Whitney test was used. Correlation coefficient of r+ Pearson was used for the description of correlations between the tested characteristics. Where there were correlations, the regression straight lines were determined. In the discussion of results the asterisk (*) means a statistically significant difference ($p<0.05$).

Method

Clinical examinations

In each patient, on the first days of hospitalisation a structured interview was carried out (according to a special questionnaire), involving various factors of the risk of suicidal ("S") behaviour; each underwent a complete psychiatric examination in compliance with the multiaxial diagnostics DSM IV, using the 100-point Global Assessment of Functioning Scale GAF [39, 40] and mandatory criteria of mental disorders ICD-10 [15], and specific indices of the organic impairment of the CNS were traced [41].

In addition, each adolescent patient was examined with the Purpose in Life Test (PIL) [42], evaluating the level of the global sense of life (the boundary result for the American population is 111.5). The patients were requested to present their opinion on 20 statements included in part A of the PIL test, through determining the compatibility level on a scale from 1 to 7 (1 – total lack of compatibility, 4 – neutral status, 7 – total compatibility).

Furthermore, each patient was evaluated in view of the risk of repeating the suicide attempt (SA), according to the three-degree scale: 1/ low risk of suicide (the patient during the examination denied having current S ideation and tendencies and/or expressed regret because of having made the SA), 2/ medium suicidal risk (the patient was not sure whether or not he would repeat the SA, and/or did not criticise his S behaviour), 3/ high suicidal risk (the patient confirmed during the examination the presence of S ideation and tendencies, saying that he would commit suicide after all). None of the ACI group patients exhibited suicidal behaviour in the interview.

Biochemical studies

Each subject (after detoxification and adaptation to hospital conditions, usually between the 2nd and 6th day of hospitalisation) had his venous blood collected at 8 a.m., on an empty stomach, for determination of: OB, leucocytosis, proteinogram, cortisol, ACTH, Il-2 and sIl-2R. Subsequently, at 11 p.m. 1 mg of dexamethasone was administered orally, and then at 8 a.m. (also on an empty stomach) again his venous blood was collected to determine the level of cortisol and ACTH to make DST [32].

The level of cortisol in the serum was determined by immunoenzymatic, chemiluminescence method EIA, using the set of Ortho – Clinical Diagnostics Amersham UK, with the AMERLITE system made by Johnson & Johnson. As a standard, the cortisol level of < 24 ěg/100 ml in girls and <30 ěg/100 ml in boys was adopted, whereas the >5 ěg/100 ml cortisol level was considered to be a pathological DST result.

The plasma ACTH level was determined by immunoradiometric method, using the set of CIS BIO INTERNATIONAL – France (ELSA – ACTH). The standard for healthy subjects is 10-60 pg/ml.

Determinations of interleukin - 2 (Il-2) and soluble receptor Il-2 (sIl-2R) were performed by the ELISA technique, using the commercially available sets of Pharmingen company.

Results

The analysis of detailed sociological studies (table 1)[2] indicates that in the ASA (examined) group, the girls were statistically significantly more prevalent (70%)*, whereas in the ACI (control) group, as in the general population, there were no differences between the number of girls and boys. The other variables which statistically significantly differentiated the examined groups were parents' addictions other than alcoholism (more frequently reported nicotinism in parents of ACI group) and suicides in ASA families.

Almost in all subjects of the ASA group (N=83; 98.8%) various mental disorders coded on axis I were confirmed, according to multiaxial diagnostics in the DSM IV [39]. A detailed distribution of specific mental disorders in the examined groups is presented in table 2 (nomenclature acc. to ICD-10 [18]). These were mostly depressive disorders, including adjustment disorders with depressed mood in 42 persons (50%)* and a depressive episode in 9 persons (10.7%) as well as adjustment disorders with disturbance of emotions and conduct (N=17; 20.2%). On the other hand in the ACI group, the axis I mental disorders were found only in 20% of subjects (statistically significantly less prevalent than in ASA; p=0.0000)*. In addition more than half of the ASA subjects (N=45; 53.6%) had an additional diagnosis coded on axis II, mainly personality disorders of histrionic and anxiety type, often with marked impulsiveness, whereas in the ACI group this referred to only 4 persons, i.e. 13.3% (p=0.0162)*. Individual diagnostic categories from axis II, as well as the presence of specific indices of organic impairment of the CNS, did not differentiate the examined groups in a statistically significant way.

As many as 1/3rd of adolescents after suicidal poisonings confirmed having persistent suicidal ideation and tendencies (medium and high suicidal risk – Figure 1). In the ASA subgroup with symptoms of organic impairment of the CNS, a similar percentage of persons confirmed persistent suicidal ideations and tendencies as that in the ASA subgroup without organic impairment of the CNS (N=8; 33.3% vs. N=17; 28.3%).

Preliminary analysis of the data pointed to the need to include sex when interpreting

[2] Characteristics of groups were presented in earlier studies on other suicidal behaviour aspects

the results, because of a significant predominance of girls in the examined group.

Comparison of the prevalence of increased serum level of cortisol in those groups (for girls > 24µg /dl, for boys > 31µg /dl) did not demonstrate any statistically significant differences – 9 cases in the ASA group and 1 in the ACI group (10.7% vs. 3.3%; p=0.3949). In the comparison of those values separately for girls and boys, no statistically significant differences were indicated, either.

The lack of cortisol suppression after dexamethasone (N DST – cortisol > 5µg / dl) was found in 10 persons (11.9%) in the ASA group, of this - in 9 girls, and in 2 persons (6.6%) in the ACI group, of this - in 1 girl. Although N DST was almost twice more prevalent in the ASA group than in ACI group, the difference was not statistically significant (p=0.6484). A separate comparison of the prevalence of N DST in subgroups of girls and boys did not demonstrate any statistically significant differences.

Comparison of the mean values (+/- standard error - SE) of the levels of ACTH and cortisol before and after administering dexamethasone in the examined groups (table 3) indicated that only the mean values of cortisol levels after dexamethasone were significantly higher in ASA, as compared to ACI. When sex was included into the comparisons it appeared that the indicated difference of the mean values of cortisol levels in DST referred only to girls (2.9+/-0.6 vs. 1.3+/-0.6: p=0.0078).

In order to evaluate how much the cortisol level before and after dexamethasone depends on the type of mental disorders, some analogous comparisons were made between selected diagnostic ASA subgroups (N=83) – 1/ASA with a depressive episode (N=9), 2/ ASA with a depressed mood (N=42), 3/ ASA with depressive disorders jointly (N=51), 4/ ASA with schizophrenia (N=5), 5/ ASA with psychotic disorders jointly (N=10) and ACI subgroup without mental disorders (N=26). It appeared that statistically significant differences between the mean levels of cortisol after dexamethasone referred only to the ASA subgroup with depressive disorders jointly (2.70 vs. 1.72; p=0.05), and after inclusion of sex - only to female sex (2.92 vs. 1.52; p=0.0401). As regards the basal level of cortisol there were no differences between individual diagnostic ASA subgroups and ACI subgroup without mental disorders.

Evaluation of the examined groups by the GAF scale and PIL test indicated that the ASA group subjects had a statistically significantly lower functioning level, as compared to the ACI group (mean value 58.8+/-0.2 vs. 78.3+/-0.2; p=0.0000) and also significantly lower measurements in the PIL test (mean value 90.4+/-2.4 vs. 108.7 +/-3.1; p=0.0001).

A statistically significantly positive correlation was found between the results in the GAF scale and the PIL test, also after inclusion of sex (for girls r=0.44, for boys r=0.67; at p<0.05)*. However, no correlation was found between the functioning evaluation in GAF and cortisol level after dexamethasone (r=-0.11, p> 0.05), as well as between the results in PIL and cortisol level after dexamethasone (r=-0.08, p>0.05).

The presence of psychosocial stressors of clinical importance was found in almost all ASA (N=81) patients, whereas in the ACI group only in nearly a half (N=13; p= 0.0000)*. The most common stressors in the ASA group were environmental problems (N=29 – 34.5% vs. 10% MZP; p=0.0742), followed by family problems (N=26 – 30.1% vs. 26.7% MZP) and school problems (N=17 – 20.2% vs. 0% ACI;

p=0.0358)*, which were the only ones to occur statistically significantly more often in ASA than in ACI.

When the mean values of cortisol levels were compared before and after dexamethasone in ASA subgroup with stressors and in the analogous ACI subgroup, it appeared that there was no significant difference (cortisol – mean value 15.4+/-0.8 vs. 14.7+/-2.4; p=0.7383 and cortisol in DST – 2.5+/-0.4 vs. 1.0+/-0.2; p= 0.1545), but when the same values in the ASA subgroup with stressors were related to the ACI subgroup without stressors (cortisol in DST – 1.9+/-0.8) it appeared that the statistically significant difference referred only to the mean level of cortisol after dexamethasone (p=0.0178)*. The mean levels of cortisol before dexamethasone did not differentiate the examined subgroups (ASA with stressors and ACI without demonstrated stressors) although the statistical analysis indicated a positive correlation between cortisol levels before administration of dexamethasone and cortisol concentrations in DST (r=2.25; p< 0.05).

Table 4 compares the mean values of ACTH and cortisol levels before and after dexamethasone in the ASA subgroup with an increased risk of repeated suicide attempt (2nd and 3rd degree of S risk) and in the ACI group (without such risk). Statistically significant differences referred only to the mean levels of cortisol after dexamethasone. When sex was included, the demonstrated differences between the mean values of cortisol in DST remained at the statistical significance level only for girls (2.32 vs. 1.27; p=0.0036).

Furthermore, it was checked whether there is a linear correlation between increased levels of cortisol after dexamethasone and decreased values in PIL (r=-0.08; p>0.05) and low assessments in GAF (r=-0.12; p>0.05), which were considered as important for suicidal behaviour. The statistical analysis did not confirm such correlation. Neither was the correlation between increased cortisol levels after dexamethasone in the ASA group and Il-2 levels (r=-0.07; p>0.05) and sIL-2R (r=-0.09; p>0.05) confirmed[3].

Discussion

More than a twofold predominance of females in the adolescent population after suicidal poisonings corresponds to literature data [6, 10, 36, 40] mentioning more prevalent suicide attempts made by girls during their early and sometimes middle adolescence. This may point to some different biological predispositions in girls.

Despite the expectations, the other sociological variables did not significantly differentiate the examined groups, apart from a significantly higher prevalence of suicides in ASA families. The obtained results do not confirm the literature data [6, 10, 24, 38, 40] on the correlation between the comprehensively conceived family pathology and increased suicidal risk in adolescents. These discrepancies may result from the selection of control groups. In the mentioned research the control groups were selected out of the healthy subjects population, whereas in the presented studies those in the control group were in a similar clinical situation as those from the examined group, i.e. in

[3] Detailed data on the immunological system are presented in other articles ([43], subsequent in

hospital conditions. Such a selection of the control group was aimed at elimination of a possible impact of stress connected with hospitalisation.

Quite many studies confirm the correlation between the HPA axis dysfunction and suicidal behaviour in children and adults [12, 14, 26, 35]. In the ASA group the increased cortisol levels before administration of dexamethasone were 3 times more frequent than in controls (10.7% vs. 3.3%), however the difference was not statistically significant. Dahl et al. [5] indicated that only the level of cortisol determined just before falling asleep (i.e. during the physiological suppression of cortisol secretion) differentiates the group of adolescents with MD from the control group. Pffefer et al. [26] stated that the correlation between suicidal behaviour in children and cortisol level depends mainly on the severity of the suicide attempt.

In the ASA group the cortisol level after dexamethasone was twice as high as that in the ACI group. The indicated difference was statistically significant, however when sex was taken into account it referred only to girls.

The lack of cortisol secretion after dexamethasone (N DST) was found in almost 12% of the ASA group, whereas in the control group in over 6%, i.e. it was almost twice as frequent in the ASA group, however the difference was not statistically significant. Neither was the statistically significant difference between the groups found when sex was included into the studies. Similar results were obtained by Dahl et al [5] – N DST index in adolescent patients with MD reached 15%, and in the control group - 9% (i.e. the DST sensitivity in that study was 15%, and specificity 91%). Almost half of the MD subjects admitted having S ideation and tendencies, however the N DST index did not differentiate that subgroup of patients from the subgroup which did not admit having S ideation. In most studies [5] the authors determined cortisol levels in DST at least 3 times a day: at 8.00 a.m., 4.00 p.m. and 11.00 p.m., which increased the probability of finding N DST. The presented studies were confined to one measurement of cortisol only, owing to the laboratory procedure applied and the young patients attitude, as they were reluctant to undergo any medical tests. The survey of literature implies that the cortisol level in DST depends on many factors directly connected with the testing procedure itself, among others on: frequency and mode of blood collecting, dexamethasone dose (negative correlation between cortisol level in DST and dexamethasone level in serum) and the presence of environmental stressors [5]. With considerable increase in stressors, even in healthy people a high index of N DST is found (e.g. during public performances N DST occurred in 44% of examined volunteers [5]).

The studies confirm the correlation between N DST and the presence of a stressful reaction. In over 96% of the ASA patients, the presence of psychosocial stressors with clinical intensification was found, while in the control group – only in 43%. In the ASA subgroup with the demonstrated presence of stressors, the cortisol levels in DST were statistically significantly higher than in the ACI subgroup without stressors, whereas the mean levels of cortisol before dexamethasone did not statistically differentiate the examined subgroups. Although some authors indicated a correlation between the 24 h urinary cortisol excretion and a stressful reaction [25, 28, 30, 32], this correlation was not confirmed in patients with post-traumatic stress disorder (although their CRF

levels were significantly higher) [7, 28].

Almost in all ACI subjects, various mental disorders were found (in 98.8%). Studies carried out by other authors [44, 45] indicated the presence of psychopathology in approximately 90% of adolescents after suicide attempts. The higher index of mental disorders in the presented ASA group may result from the fact that the psychiatric examinations were carried out on the 2nd – 3rd day after the suicidal poisoning attempt. In this period there may still be adjustment disorders resulting from exposure to a stressful situation.

The literature data point to a strong correlation of depressive disorders with HPA axis dysfunction. It was revealed in patients with depression in different age groups, no matter what the patients' sex was [2, 10, 14, 19, 36, 46]. The presented studies indicated also the correlation between the presence of depressive disorders (of different aetiology) and an increased cortisol level in DST, however when sex was considered, it referred only to girls. Pffefer et al [26], examining patients after suicide attempts, did not confirm any correlation between N DST and psychiatric diagnosis, and one of the studies even indicated a decreased level of cortisol in depressive patients with suicidal behaviour [23].

Psychological evaluation of the examined groups demonstrated that ASA had a statistically significantly reduced level of global functioning (measured by the GAF scale) and global sense of purpose in life (the PIL test), as compared to ACI. This corresponds to the presuicidal syndrome described by Ringel [47], i.e.: narrowing of personal capabilities, the world of feelings, interpersonal relations (GAF range) and the world of values (PIL range). No correlation was found between the level of functioning (in GAF) and the sense of purpose in life (in PIL) and cortisol level after dexamethasone. Perhaps the indicated correlations between adolescents' suicidal behaviour and low social functioning and reduced sense of purpose in life reflect only those psychological conditions which do not depend on biological predispositions. Other authors, when studying the psychological aspects of suicidal behaviour, focussed primarily on various temperament dimensions; e.g.Westrin et al [38] indicated a positive correlation between the cortisol level in DST and verbal extraversion and aggression in suicidal patients and negative correlation between the cortisol level in DST and subdued aggression in the control group.

As many as 1/3rd of the subjects after suicide attempts (ASA) confirmed the persistence of suicidal ideation and tendencies. Results of other studies [34, 45, 48] indicated a high risk of repeated suicide attempts by adolescents. It was demonstrated that in the ASA subgroup with an increased risk of a repeated suicide attempt, the cortisol levels in DST were statistically significantly higher, as compared to controls. This result relates to literature data [10, 16] about the significantly more prevalent HPA axis disorders in the subjects after repeated S attempts, as compared to those after the first S attempt. It may be assumed that the increased cortisol level after dexamethasone forecasts an increased risk of repeating S attempts. Furthermore, according to some authors the increased cortisol level in DST correlated with the violence of suicide attempts [9, 16, 34, 36] and their severity [26]. Studies by Träskman-Bendz et al. [35] did not confirm such correlation.

Although in both examined groups (ASA and control) a positive correlation was found between cortisol levels before dexamethasone administration and cortisol levels in DST, yet no correlation could be confirmed between the cortisol level in the serum before dexamethasone administration and suicidal behaviour and increased risk of repeating S attempts. Similar results were obtained in the studies carried out by Roy [9].

The obtained results did not confirm the correlation between the selected parameters of the immunological system (Il-2, sIl-2R) and HPA axis dysfunction [30, 32, 33], which had been mentioned in literature.

A certain novelty in the studies is the selection of the control group, including only those persons who stayed in comparable conditions. This allowed to eliminate the effects of a stressful situation, which the hospital environment no doubt creates.

Conclusions

1) The increased serum level of cortisol was 3 times more frequent in the group of adolescents after suicide attempts (ASA) than in the control group of accidentally poisoned adolescents (ACI), whereas the lack of suppression of cortisol by dexamethasone – was almost twice more frequent. The demonstrated differences were not statistically significant.

2) In the ASA patients, the cortisol level after dexamethasone was statistically significantly higher than that in ACI group, and when sex was considered, the difference referred only to girls.

3) Higher cortisol levels after dexamethasone in the ASA group were connected with diagnosed depressive disorders (mostly in girls) and indicated the presence of stressors and an increased risk of repeated suicide attempts.

4) In the ASA group the statistically lower levels of global functioning and global sense of purpose in life was found, as compared to the ACI group. Yet, no correlation was found between those levels and cortisol level after dexamethasone.

5) In the ASA group no correlation was found between the levels of Il-2 and sIl-2R and cortisol level after dexamethasone.

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Table 1

Sociological evaluation of adolescents after suicidal poisonings (examined group) and accidental group (control group)

Variables	Examined group n=84	Control group n=30	p – significance level
Males	25 (29.8%)	15 (50.0%)	0.0402*
average age	16.6	17.7	0.3213
Females	59 (70.2%)	15 (50.0%)	0.0402*
average age	17.4	17.3	0.8916
Dwelling place			
Town	80 (95.2%)	28 (93.3%)	0.6324
Rural area	4 (4.8%)	2 (6.7%)	0.6324
Type of school			
Primary	22 (26.2%)	7 (23.3%)	0.7528
Secondary Basic Vocational	17 (20.2%)	5 (16.7%)	0.8700
Secondary Technical	14 (16.7%)	3 (10.0%)	0.5010
High school	25 (29.8%)	9 (30.0%)	0.9205
Other	6 (7.1%)	6 (20.0%)	0.0480*
Family situation			
Incomplete family	31 (36.9%)	9 (30.0%)	0.4064
Parents death before age 15	13 (15.5%)	2 (6.7%)	0.3025
Parents Divorce / separation	25 (29.8%)	10 (33.3%)	0.7152
Bad financial standing	17 (20.2%)	7 (23.0%)	0.7211
Family pathology (generally)	51 (60.7%)	21 (70%)	0.3054
Mental diseases	16 (19.0%)	7 (23.3%)	0.6150
Parents' alcoholism	27 (32.1%)	11 (36.7%)	0.6519
Other addictions	8 (9.5%)	8 (26.7%)	0.0203*
Suicides in family	10 (11.9%)	0 (0%)	0.0470*
Frequent conflicts	39 (46.4%)	10 (33.3%)	0.2130
Physical violence	4 (4.8%)	1 (3.3%)	0.8483

*Chi^2 test (possibly with Yates correction) – statistically significant differences

Table 2

Prevalence of mental disorders in the adolescent population after suicidal (ASA) and accidental intoxication (ACI)

Psychiatric diagnosis	ASA N=84	%	ACI N=30	%	p – significance level
Depressive episode	9	10.7	0	0	0.1406
Adjustment disorder with depressed mood	42	50.0	2	6.6	0.0001*
Disturbance of emotions and conduct	17	20.2	2	6.6	0.1537
Schizophrenia	5	6.0	0	0	0.3968
Other psychotic disorders	5	6.0	0	0	0.3965
Substance dependence	2	2.4	2	6.6	0.6051
Other disorders	3	3.6	0	0	0.7005
Indices of OC NS impairments	24	28.6	6	20	0.3601
No mental disorders found	1	1.2	24	80	0.0000*

*Chi ^{2} test (possibly with Yates correction) – statistically significant differences

Table 3

Comparison of mean values (including standard error SE) of selected parameters in a group of adolescents after suicidal (ASA) and accidental intoxication (ACI)

Parameters	ASA		ACI		p – significance level
	Mean value	SE	Mean value	SE	
Cortisol	15.33	0.74	14.38	1.37	0.6922
Cortisol+ DST	2.49	0.42	1.54	0.45	0.0179*
ACTH	40.04	3.46	38.81	5.40	0.7894
ACTH-DST	13.59	0.89	13.29	0.66	0.1225

Table 4

Comparison of the mean values (including standard error SE) of selected parameters in a group of adolescents in the ASA group with increased risk of repeating suicide (2nd and 3rd degree) and ACI group without such risk

Parameters	Increased S risk in ASA group		Without S risk in ACI group		p – significance level
	Mean value	SE	Mean value	SE	
Cortisol	15.57	1.60	14.4	1.37	0.6974
Cortisol+ DST	2.24	0.50	1.54	0.44	0.0076*
ACTH	45.86	6.14	38.81	5.40	0.6061
ACTH-DST	13.69	1.04	13.29	0.66	0.6974

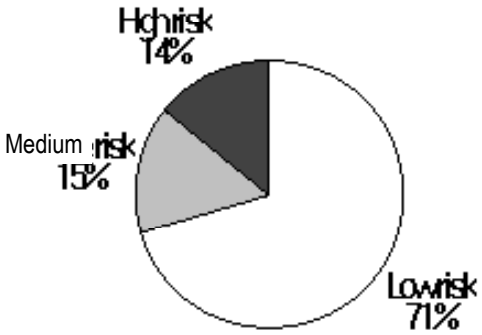

Figure 1 **Risk of repeated suicide attempt in adolescents after suicide attempt**

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