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Neuroleptic-Associated Hyperprolactinemia: Clinical Manifestations and Effects on Sexual Function

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Objectives. To study the clinical manifestations of neuroleptic-associated hyperprolactinemia (NAH) and its influences on sexual functions in patients with mental disorders and prolonged treatment with neuroleptics. **Materials and methods.** A total of 244 patients were investigated – 140 women and 104 men – with mental disorders and receiving treatment with neuroleptics. Blood prolactin and bioactive prolactin levels were estimated in all patients, these assays in some patients being accompanied by determination of gonadotropins, sex hormones, and sex steroid-binding globulin. Side effects of neuroleptics were assessed using the UKU Side Effects Rating Scale. Impairments to sexual functions were assessed using the Psychotropic-Related Sexual Dysfunction Questionnaire. **Results and conclusions.** Asymptomatic NAH was detected in 16% of women and 37% of men. In women, NAH led to impairments in the menstrual cycle – oligo- or amenorrhea – and galactorrhea. NAH was accompanied by sexual impairments in both in both men and women. In patients of both genders, NAH was associated with weakening of libido and deterioration of quality of life due to sexual impairment. In addition, women with NAH had delayed onset of orgasm and vaginal dryness during sexual intercourse. In men, NAH was also associated with erectile dysfunction. In contrast to tumor-related and idiopathic hyperprolactinemia, NAH was not accompanied by increases in body weight and the development of obesity, or the development of hypogonadism in patients of either gender.

Keywords: hyperprolactinemia, prolactin, neuroleptics, antipsychotics, schizophrenia, sexual dysfunction, galactorrhea, decreased libido, erectile dysfunction.

The clinical expression of idiopathic and tumor-related hyperprolactinemia have been well studied, while it is not always possible to identify the symptoms of neuroleptic-associated hyperprolactinemia (NAH) [1–3]. This is because some of the symptoms, such as impairments in the sexual domain or increases in body weight, may be mediated by both increases in prolactin levels and the effects of psychotropic drugs and mental disorders themselves. In addition, there is as yet no universally accepted view on the relationship between NAH and impairments to the menstrual cycle and decreases in estrogen levels in women [4–9]. Some studies using very small cohorts [4–6] have not demonstrated a relationship between NAH and impairments to the menstrual cycle. Larger studies [8, 9] have yielded contradictory results pointing to a correlation between NAH and impairments to the menstrual cycle in women, and also decreases in the levels of sex hormones in patients of both genders. It remains possible that impairments to the menstrual cycle correlate with the severity of the mental disorder, regardless of the prolactin level [7]. Results from studies of the influences of NAH on body weight are also contradictory. Most

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reports indicate that NAH is not accompanied by any increase in body weight or the development of obesity. Thus, the greatest increases in body weight in patients receiving risperidone or other neuroleptics were seen in women with the lowest prolactin levels [10], while other studies found no link between prolactin levels and increases in body weight [11, 12]. Nonetheless, one study [13] in patients taking atypical neuroleptics revealed a positive correlation between prolactin levels and body mass index, though only among male out-patients.

The question of the role of NAH in the development of hypogonadism in men and women is also controversial. The authors of [5], who observed 67 out-patients with schizophrenia treated with typical neuroleptics, showed that prolactin levels correlated negatively with estradiol and progesterone contents, the levels of the former being significantly lower in women with NAH than in the group with normal prolactin levels. Some publications [14, 15] demonstrated significantly lower gonadotropin levels in patients with NAH than in a group with normal prolactin levels, though other studies [4, 16] did not find any link between NAH and hypogonadism in women. A link between NAH and hypogonadism in men was supported in a study of 255 patients receiving risperidone or typical neuroleptics, though only total testosterone was determined in this study [17]. Some studies [5, 18] did not establish a link between NAH and decreases in testosterone levels in men.

The effects of NAH on sexual function are also not entirely clear. Serretti et al. [17] produced a meta-analysis of 34 studies addressing sexual dysfunction in patients with mental disorders receiving neuroleptics. Use of drugs with high probabilities of producing NAH (olanzapine, risperidone, haloperidol, clozapine, and thioridazine) is more commonly (40–60%) accompanied by sexual impairments, while sexual dysfunction was rarer (16–27%) in patients receiving treatment with neuroleptics with minimal influences on prolactin secretion (quetiapine, ziprasidone, and aripiprazole) [19]. Other studies [20, 21] of patients of both genders receiving typical and atypical neuroleptics showed that NAH was accompanied by impairments to libido and orgasm, and also to erection in men. Some studies [22] found that prolactin levels in men correlated positively with total scores on a sexual impairment scale and decreased scores on the libido subscale. NAH occurring on the background of typical neuroleptics was accompanied by erectile dysfunction and impaired orgasm in men. In women, there were reductions in libido and vaginal lubrication during sexual intercourse [23]. The adverse effect of NAH on sexual function in men receiving risperidone were emphasized by Nakonezny et al. [24], which found a significant positive association between prolactin levels and total points scores on the Arizona Sexual Experience (ASEX) scale and several of the ASEX subscales (strength of libido, sexual arousal, erectile function). A number of studies [10, 24–28] in patients receiving risperidone, olanzapine, aripiprazole, haloperidol, and quetiapine did not identify any link between NAH and sexual impairments.

These contradictory study results are probably associated mainly with differences in study groups in terms of age, severity of mental disorders, type of psychotropic treatment, etc. [9–11]. In addition, we cannot fail to note that most studies [3, 10, 26, 28] used statistical methods addressing only one factor – NAH – thus not paying attention to the effects of other factors.

The aim of the present work was to study the clinical pictures of NAH and its effects on sexual function in patients with mental disorders and long-term treatment with neuroleptics.

Materials and Methods. This cross-sectional (one time point) study used continuous screening: patients were recruited regardless of the presence of symptoms potentially associated with NAH.

The cohort of patients was formed at a psychiatric clinic – Alekseev Moscow City Psychiatric Hospital No. 1, from February 2011 to November 2012. The study included 244 sequentially recruited patients (140 women, 104 men) who met the following criteria: age 19–45 years and presence of a mental disorder requiring long-term use of neuroleptics. Exclusion criteria were all states which could induce increases in prolactin levels: hypophyseal tumors, use of other drugs able to produce hyperprolactinemia (antiemetics, formulations containing female sex hormones), pregnancy, postnatal lactation, hypothyroidism, renal failure, liver failure, etc. The cohort included patients with mental states of different severity: 46% of patients were selected in departments treating acute forms of mental disorders, 23% in medical departments, and 31% from day clinics. Mean age was 32.7 ± 6.8 years (range 19–45 years).

Data on psychiatric diagnoses, durations of mental illness, mental status, and psychotropic medication were obtained from patients' medical records.

The course of mental disorders was evaluated in the following categories: acute episodes, torpid, chronic, remission.

The study group included the following mental disorder: schizophrenia (88% of patients), acute polymorphic psychotic disorder with symptoms of schizophrenia (4%), affective disorders (5%), and mental retardation with behavioral impairment (3%). More detailed data on mental illnesses have been published in our previous report [28].

Blood prolactin levels were determined in all patients taking part in the study (the normal value for women is 90–540 mU/liter and that for men is 60–510 mU/liter), as were thyroid-stimulating hormone levels (to exclude hypothyroidism as a possible cause of hyperprolactinemia). Gonadotropins (LH, FSH) and sex hormones (estradiol, total testosterone, and sex steroid-binding globulin (SSBG)) were also assayed in some cases.

Bioactive prolactin was assayed by PEG precipitation (normal values 64–395 mU/liter in women and 73–380 mU/liter in men) [1]. The quantity of macroprolactin was deter-

TABLE 1. Effects of NAH on the Menstrual Cycle and Galactorrhea

Parameter	Female patients with normal prolactin levels	Female patients with NAH	*p*
Frequency of menstrual cycle impairments, %	31	54	0.01
oligomenorrhea	21	36	Not significant
amenorrhea	0	10	0.01
polymenorrhea	0	3	Not significant
dysmenorrhea	5	4	Not significant
Frequency of galactorrhea, %	7	63	<0.001
spontaneous	0	6	Not significant
on compression	7	57	<0.001

mined by subtracting bioactive prolactin from total prolactin. Hyperprolactinemia was taken as a bioactive prolactin level of greater than the upper limit of the normal range. Free testosterone was determined from total testosterone and SSBG.

Semiquantitative assessment of the side action of neuroleptics was obtained using the UKU Side Effects Rating Scale for neuroleptics using questions addressing body weight, the sexual domain, galactorrhea, and, for women, the menstrual cycle. The presence and severity of each side effect were assessed in points: 0 – side effect absent; 1 – mild; 2 – moderate; 3 – severe [29].

Impairments to sexual functions were assessed using the Psychotropic-Related Sexual Dysfunction Questionnaire (PRSexDQ). The presence and severity of sexual impairments were also evaluated in points: 0 – absence of impairment; 1 – mild; 2 – moderate; 3 – severe [30].

Statistical analysis was performed in Statistica 8.0 for Windows, release 8.0 (Stat Soft Inc., USA) and Stata 11 (Stat Corp. LP, USA). Quantitative data are presented as means and standard deviations. Groups were compared depending on the type of distribution using Student's *t* test (for data with a normal distribution) and the Mann–Whitney test (data with distributions deviating from the normal). Relationships between parameters were analyzed by parametric Pearson correlation analysis and nonparametric Spearman correlation analysis. Proportions were compared using Fisher's exact test and the χ^2 test. The critical value for statistical significance was $\alpha = 0.05$.

Independent associations of clinical symptoms with bioactive prolactin levels were assessed by constructing a multiple linear regression model. This included the following parameters: gender, age, nature of mental disorder (schizophrenia spectrum disorder, mood disorder, organic disorders, etc.), duration of mental disorder, course, psychotropic drugs used, sex hormone levels, body mass index (BMI), clinical symptoms, and measures on the UKU and PRSexDQ scales. The set of clinical symptoms included data on the nature of the menstrual cycle in women (regular menstrual cycle, impairments as poly-, dys-, oligo- and amenorrhea), data on galactorrhea in women (absence, galactorrhea on compression of the breasts, or spontaneously). Psychotropic drugs were divided into groups: neuroleptics, antidepressants, anticonvulsants, anxiolytics, and lithium formulations. Neuroleptics were analyzed individually and as the most widely used combinations. The critical significance level was for regression analysis was taken as $\alpha = 0.1$.

Results. The frequency of NAH in the study patients was 53% (64% in women and 48% in men).

Clinically asymptomatic variants of NAH were found in 13 of 80 women with NAH (16%) and, significantly more frequently, in 15 of 40 men (37%) ($p = 0.03$). Asymptomatic NAH was seen in both moderate and severe hyperprolactinemia. Bioactive prolactin levels in patients with asymptomatic NAH were not significantly different from values in patients with clinical signs, either in men or in women.

Effects of NAH on the menstrual cycle, galactorrhea, and gynecomastia. Menstrual cycle impairments were seen in 42 of 78 female patients with NAH (54%) (the number of women with NAH was smaller here than in the description of asymptomatic NAH because data on the menstrual cycle could not be collected from all patients). Women with normoprolactinemia had a lower frequency of menstrual cycle impairments – these were present in 13 of 42 (31%) ($p < 0.05$) (Table 1). It should be noted that this difference could be explained only by the greater frequency of amenorrhea in female patients with NAH than in those with normoprolactinemia ($p = 0.01$), while the frequencies of oligo-, poly-, and dysmenorrhea in groups of women with and without NAH were not significantly different (see Table 1).

Galactorrhea was found in 50 of 80 female patients with NAH (63%) and only three of 41 women with normal prolactin levels (7%) ($p < 0.001$). Galactorrhea was spontaneous in only five female patients with NAH and the women did not report it independently. In the majority of cases (45 female patients) of cases, galactorrhea was detected only on compressing the breasts (see Table 1).

TABLE 2. Subscales on PRSexDQ and UKU Questionnaires Significantly Associated with Bioactive Prolactin Levels in Patients of Both Genders (multiple linear regression analysis data)

Subscales	Corrected R^2, %	Coefficient β	*p*
Points on decreased libido, PRSexDQ questionnaire	48		
1 – Small decrease in libido, interest in sexual activity slightly decreased		0.17	0.02
2 – Moderate decrease in libido, interest significantly decreased		0.18	0.01
3 – Strong decrease in libido, virtually no interest in sexual activity		0.09	0.16
Points on decreased libido, UKU questionnaire	53		
1– Slight decrease in libido, not producing discomfort		0.11	0.43
2 – Clear weakening in libido and sexual activity producing significant problems		0.03	0.15
3 – Libido and sexual activity very low (patients have almost no sex life)		0.24	0.08
Points on effects of sexual impairments on quality of life subscale of PRSexDQ questionnaire	52		
1 – Impairment present but not very disturbing to patient		0.12	0.08
2 – Impairment with strong influence on patient's life, hindering relationship with sexual partner		0.14	0.03
3 – Sexual impairments with very strong effects on patient's life, causing patients to intend to stop taking medication		0.24	0.65

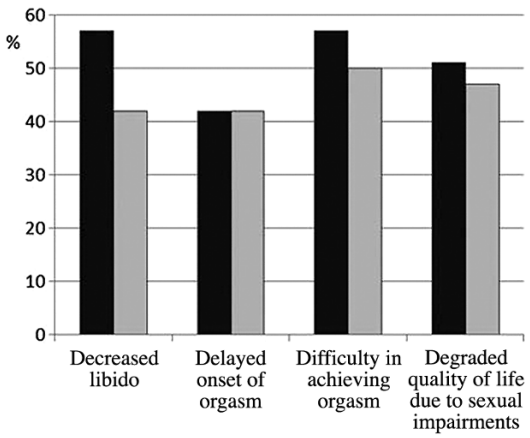

Fig. 1. Frequencies (%) of various sexual impairments (PRSexDQ scale) in patients of both genders with NAH and normal prolactin levels. Here and Figs. 2–6: black columns show NAH; gray columns show normal prolactin levels.

Multiple linear regression analysis identified a positive relationship between bioactive prolactin and impairments to the menstrual cycle of the oligomenorrhea type (corrected $R^2 = 59\%$; coefficient $\beta = 0.42$; $p < 0.001$) and amenorrhea (corrected $R^2 = 59\%$; coefficient $\beta = 0.28$; $p < 0.001$). In addition, there was a positive relationship between bioactive prolactin and galactorrhea on compression of the breasts (corrected $R^2 = 58\%$; coefficient $\beta = 0.39$; $p < 0.001$) and spontaneous galactorrhea (corrected $R^2 = 58\%$; coefficient $\beta = 0.21$; $p = 0.01$).

Among men with normal prolactin levels, gynecomastia was found in 11 of 37 cases (30%), which was not statistically significantly different from that among patients with NAH (29%). Among men with gynecomastia, NAH was present in 10 of 21 cases (48%); the frequency among men without gynecomastia was the same – in 25 of 51 (49%) (difference not significant). Thus, gynecomastia in men with mental disorders was not a specific diagnostic sign of NAH. Galactorrhea was not seen in men.

Influence of NAH on sexual function. The frequency of sexual impairments among patients of both genders, as indicated by the PRSexDQ scales, did not depend on the presence or absence of NAH (Fig. 1). Mean total scores on PRSexDQ scales in patients with NAH did not differ from those in patients with normal prolactin levels.

UKU data showed that decreased libido was commoner in patients with NAH than among patients with normal prolactin levels ($p = 0.02$) (Fig. 2).

Statistical analysis established a positive statistically significant correlation between the bioprolactin level and scores on PRSexDQ subscales characterizing difficulties in achieving orgasm ($r = 0.2$, $p = 0.02$) in patients of both genders.

Subscales of the PRSexDQ and UKU questionnaires which were shown by multiple linear regression analysis to have significant associations with bioactive prolactin in patients of both genders are presented in Table 2.

Multiple linear regression analysis established that NAH was associated with loss of libido and degradation of the quality of life due to sexual impairments in patients of both genders.

TABLE 3. Subscales on PRSexDQ and UKU Questionnaires for Sexual Impairments Significantly Associated with Bioactive Prolactin Levels in Women (multiple linear regression analysis data)

Subscales	Corrected R^2, %	Coefficient β	*p*
Points on decreased libido, PRSexDQ questionnaire	67		
1 – Small decrease in libido, interest in sextual activity slightly decreased		0.08	0.32
2 – Moderate decrease in libido, interest significantly decreased		0.14	0.07
3 – Strong decrease in libido, virtually no interest in sexual activity		–0.02	0.79
Points on decreased libido, UKU questionnaire	51		
1 – Slight decrease in libido, not producing discomfort		0.34	0.00
2 – Clear weakening in libido and sexual activity producing significant problems		0.19	0.02
3 – Libido and sexual activity very low, patients have almost no sex life		0.07	0.39
Points on delayed onset of orgasm subscale	70		
1 – Slight delay in onset of orgasm		0.33	0.00
2 – Moderate delay, well noted		0.19	0.04
3 – Orgasm severely delayed or not occurring		–0.097	0.32
Points on vaginal dryness during sexual intercourse subscale	69		
1 – Sometimes, mess than 25% of occasions		0.15	0.08
2 – Frequently, 25–75% of occasions		0.18	0.04
3 – Almost always – more than 75% of occasions		–0.03	0.72
Points on effects of sexual impairments on quality of life subscale of PRSexDQ questionnaire	71		
1 – Impairment present but not very disturbing to patient		0.35	0.00
2 – Impairment with strong influence on patient's life, hindering relationship with sexual partner		0.18	0.05
3 – Sexual impairments with very strong effects on patient's life, causing patients to intent to stop taking medication		–0.08	0.36

Influences of NAH on sexual function in women. Female patients with NAH showed a higher frequency of decreased libido than women with normal prolactin levels on the PRSexDQ scale ($p = 0.03$) and the UKU sale ($p = 0.009$) (Figs. 3, and 4). Mean total points scores on the PRSexDQ in patients with NAH were not different from those in women with normal prolactin levels.

Bioprolactin levels in women correlated positively with points scores on the decreased libido subscale of the UKU ($r = 0.2$; $p = 0.03$) and PRSexDQ ($r = 0.22$; $p = 0.04$). The mean score on the UKU decreased libido subscale in female patients with NAH was significantly higher than that in women with normoprolactinemia ($p = 0.043$). In addition, increased levels of bioactive prolactin were linked with increased scores on the PRSexDQ subscale reflecting vaginal dryness during sexual intercourse ($r = 0.22$; $p = 0.04$).

Sexual dysfunction subscales on the PRSexDQ questionnaire were also significantly associated with bioactive

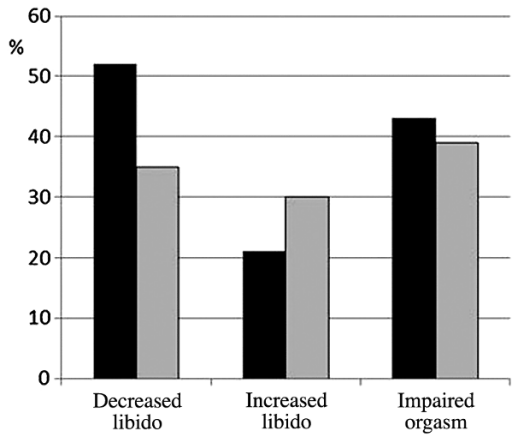

Fig. 2. Frequencies (%) of sexual impairments (UKU scale) in patients of both genders with NAH and normal prolactin levels.

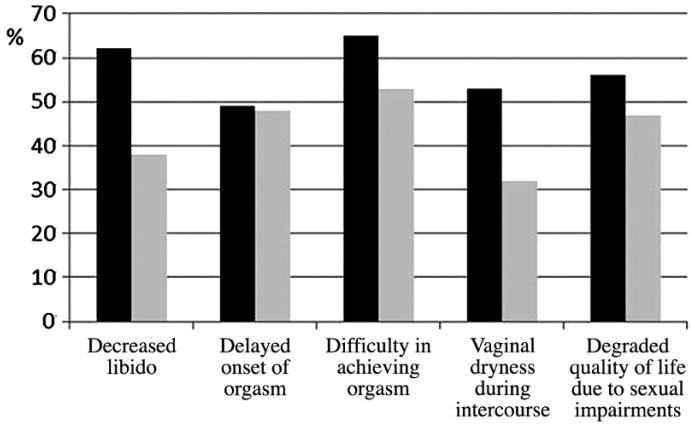

Fig. 3. Frequencies (%) of various signs of sexual dysfunctions, PRSexDQ, in women with NAH and normal prolactin levels.

prolactin in women, as indicated by multiple linear regression analysis; data are shown in Table 3.

Thus, NAH in woman was associated with decreased libido, delayed onset of orgasm, vaginal dryness during sexual intercourse, and degraded quality of life due to sexual impairments.

Influence of NAH on sexual function in men. Sexual impairments were analyzed in men using the PRSexDQ and UKU questionnaires. The frequency of sexual dysfunctions and mean total PRSexDQ scores in patients with NAH were not different from those in men with normal prolactin levels (Figs. 5 and 6).

In men there was no statistically significant correlation between the bioactive prolactin level and points scores in responses to questions on the PRSexDQ and UKU for sexual impairments.

PRSexDQ subscales significantly associated with bioactive prolactin in men by multiple linear regression analysis are shown in Table 4.

Thus, NAH in men was accompanied by decreased libido, impaired erection, and degraded quality of life due to sexual impairments. In contrast to women, there was no relationship between NAH and delay in the onset of orgasm in men.

NAH and body weight. For the whole group, there was a significant but weak negative correlation between BMI and the bioactive prolactin level ($r = –0.22$; $p = 0.003$). BMI in patients with NAH was lower than in those with normal prolactin levels ($p = 0.002$), who differed in terms of body weight from patients with other types of hyperprolactinemia.

In women, bioactive prolactin levels correlated negatively with BMI ($r = –0.27$; $p = 0.003$); BMI in female patients with NAH was lower than that in women with normal prolactin levels ($p = 0.038$). In men, there was no relationship between BMI and bioactive prolactin levels; BMI in male patients with NAH was no different from that in patients with normal prolactin levels.

Multiple linear regression analysis did not identify any associations between the bioactive prolactin level and BMI.

Effects of NAH on sex hormones. No relationship was found between bioactive prolactin and gonadotropin levels (LH, FSH) in patients of either gender; gonadotropin levels in patients with NAH were not significantly different from those in patients with normal prolactin levels.

In women, higher bioactive prolactin levels were accompanied by lower estradiol concentrations ($r = –0.28$; $p = 0.02$). Female patients with NAH had lower estradiol levels than women with normal prolactin levels. ($p = 0.04$). Lower estradiol levels were seen in 17% (6/36) of female patients with NAH but in none of the women without NAH (0%, $p = 0.02$). Gonadotropin levels in women did not correlate with bioactive prolactin. Gonadotropin levels in female patients with NAH and normal prolactin levels were not significantly different.

In men, there was no link between bioactive prolactin and free testosterone. Free and bioactive testosterone levels in patients with NAH were not different from those in men with normal prolactin levels. Decreases in free testosterone levels were seen in 44% (18/41) of patients with normal prolactin levels and 40% (12/30) of patients with NAH – the difference was not statistically significant.

Multiple linear regression analysis did not identify any link between bioactive prolactin and sex hormones in either men or women.

Discussion. In discussing the data obtained here, it should be emphasized that the study group of patients was formed by continuous selection with minimal inclusion criteria, and hyperprolactinemia was detected using screening tests. The result is that the cohort was maximally representative and included patients of different ages with mental disorders of different severities and durations. During inclusion of patients, there were no limits on the type or quantity of neuroleptics and other psychotropic drugs taken,

TABLE 4. Subscales on PRSexDQ Questionnaire Associated with Bioactive Prolactin Levels in Men (multiple linear regression analysis data)

Subscales	Corrected R^2, %	Coefficient β	*p*
Points on decreased libido, PRSexDQ questionnaire	61		
1 – Small decrease in libido, interest in sextual activity slightly decreased		0.26	0.02
2 – Moderate decrease in libido, interest significantly decreased		0.22	0.07
3 – Strong decrease in libido, virtually no interest in sexual activity		0.22	0.05
Points on erectile difficulty	48		
1 – Sometimes, less than 25% of occasions		0.24	0.09
2 – Often – 25–75% of occasions		–0.21	0.13
3 – Almost always – more than 75% of occasions		–0.01	0.93
Points on effects of sexual impairments on quality of life subscale of PRSexDQ questionnaire	47		
1 – Impairment present but not very disturbing to patient		–0.11	0.43
2 – Impairment with strong influence on patient's life, hindering relationship with sexual partner		–0.00	0.99
3 – Sexual impairments with very strong effects on patient's life, causing patients to intent to stop taking medication		0.24	0.08

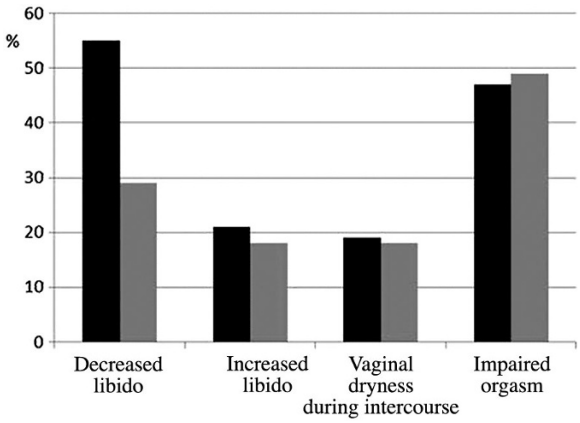

Fig. 4. Frequencies (%) of various signs of sexual dysfunction, UKU scale, in women with NAH and normal prolactin levels.

and more women were studied than in other investigations addressing this problem [5, 9, 12, 28].

In addition, our study assessed the link between clinical symptoms and bioactive prolactin, while most studies on this theme [4, 6–11, 13–15] worked with total prolactin levels. However, the most important point was that this is the first report using multiple linear regression analysis, which demonstrated a relationship between bioactive prolactin and clinical symptoms with consideration of patients' ages, the type and course of the mental disorder, the duration of illness, and psychotropic medication.

NAH was shown to induce galactorrhea and menstrual cycle impairments (amenorrhea) in women. In most female patients with NAH, galactorrhea was found only on compression of the breasts, not spontaneously, so detection by a psychiatrist requires careful examination of the breasts in women receiving neuroleptics.

The link between NAH and the decreased estradiol level in women identified by unifactorial analysis was not confirmed by multiple linear regression; the results of unifactorial analysis probably result from some other factor not detected here. The results demonstrating that NAH had no effect on sex hormones in men and women are consistent with published data [4, 5, 16, 18].

Our data indicate that NAH was not linked with excess body weight and obesity. Overall, this is also consistent with published data [10–12]. However, interpretation of this conclusion requires our study to be restricted, as it is unable to provide reliable data on body weight changes in patients with NAH and normal prolactin levels, as well as psychotropic drugs taken by patients before inclusion in the study.

The link between NAH and weakening of libido seen here in men and women is consistent with results obtained in a number of studies [21–23]. In contrast to most studies, where only the UKU scale was used, we also used the PRSexDQ – the only validated questionnaire for patients with mental disorders and receiving neuroleptics. We note that the UKU scale does not fully characterize sexual impairments [20]. It is typical that studies not finding a relationship between NAH and sexual impairments have evaluated the latter using only the UKU scale, while data processing was by unifactorial statistical methods only [6, 10, 28]. Our study showed that in women NAH is associated with the following sexual impairments: decreased libido, difficulties in achiev-

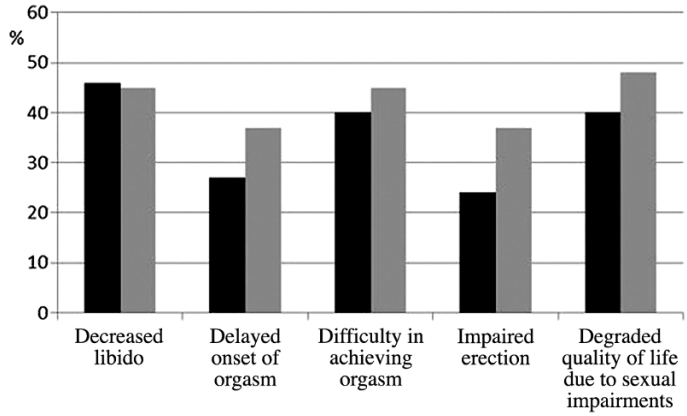

Fig. 5. Frequencies (%) of various signs of sexual dysfunction, PRSexDQ scale, in men with NAH and normal prolactin levels.

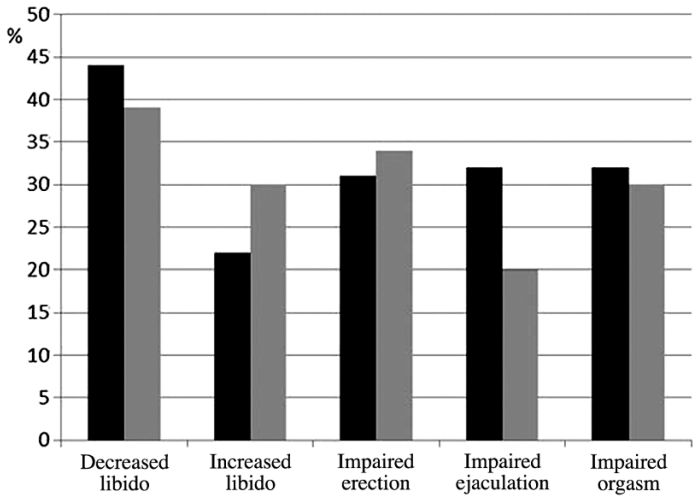

Fig. 6. Frequencies (%) of various signs of sexual dysfunction, UKU scale, in men with NAH and normal prolactin levels.

ing orgasm, and deficiency of vaginal lubricant during sexual intercourse. Similar results on the influence of NAH on sexual function in women were obtained by Smith [21] in relation to decreased libido and deficiency of vaginal lubrication; Knegtering [18] reported difficulties in achieving orgasm; Rettenbacher [19] found decreased libido and difficulties achieving orgasm. Data on the association between NAH in men with decreased libido and erectile dysfunction are consistent with data from several other studies [20, 23, 25, 31].

The information presented in this report may be useful for applied endocrinology as well as psychiatry, in relation to the potential for the timely diagnosis of NAH. Normalization of prolactin levels in NAH aids improvements in patient compliance with neuroleptic therapy.

The data obtained here lead to the following conclusions: 1) The clinical signs of NAH in women are similar to the typical clinical syndrome of galactorrhea-amenorrhea. In men, NAH is asymptomatic or involves mainly sexual impairments. 2) In contrast to idiopathic hyperprolactinemia, NAH is not accompanied by signs of excess body weight or obesity in either men or women and has no effect on sex hormone levels. 3) In patients of both genders, NAH is accompanied by sexual impairments, which in women are apparent as a decrease in libido, delayed onset of orgasm, and decreased vaginal lubrication, and in men by decreased libido and impaired erection. Sexual impairments degrade quality of life in both men and women.

The authors have no conflict of interests.

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