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Original Article

Change of sexual activity and its relation to the quality of life in older people: Cognition of Older People, Education, Recreational Activities, NutritIon, Comorbidities, fUnctional Capacity Studies (COPERNICUS)

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ABSTRACT

Objectives: Longitudinal changes in sexual activity and their impact on quality of life in older adults have not been thoroughly examined. The current study examined the change in sexual activity over two years and its relation to quality of life in older people in Poland.
Study design: This was a two-year longitudinal observational study. Changes in quality of life were evaluated using analysis of covariance models, adjusting for baseline scores, demographic factors, changes in marital status, self-rated health, and level of depression.
Main outcome measures: Change in quality of life was assessed using the World Health Organization Quality of Life scale.
Results: The sample included 199 participants (80% female, mean age 69.73 ± 6 years). No statistically significant changes in overall quality-of-life scores were noticed over two years ($p = 0.3$). After adjusting for baseline scores and covariates using analysis of covariance, cessation of sexual activity was significantly associated with lower follow-up scores in the Social Relationships ($p = 0.006$) and Environmental ($p = 0.007$) domains of the Quality of Life scale. Nested models excluding potential mediating variables (health and depression changes) confirmed the robustness of these associations.
Conclusions: Older adults who cease sexual activity experience significant temporal declines in specific quality-of-life domains, notably social relationships and environmental well-being.

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1. Introduction

Quality of life is a multidimensional construct reflecting an individual's overall perception of their physical, psychological, social, and environmental well-being. Aging is a well-known and important factor in reducing the quality of life [1–3]. While quality of life can slightly increase until early old age, it declines significantly in old age. For example, based on the Control, Autonomy, Self-realization, and Pleasure (CASP-12) scale, a previous study showed that quality of life did not decrease linearly with age. Instead, it increased from age 50 with a peak at age 68, before decreasing at older ages among community-dwelling older adults residing in the Republic of Ireland [4,5]. However, it is worth noting that several other factors, such as financial hardship, spousal loss, or poor social networks [3], can also contribute to low quality of life. This underlines that quality of life is not simply a function of age, but can be influenced by several other factors, even in old age. One such factor is sexual activity, which is frequently marginalized due to pervasive ageist stereotypes that inaccurately depict older adults as asexual. Despite these societal biases, engaging in sexual activity can improve cardiovascular health, promote blood circulation, and reduce stress and anxiety, thereby improving mental state. [6]. The frequency and importance of sexual behaviors are moderately correlated with a higher quality of life, particularly in the social and psychological domains [7]. In addition, sexual activity could be related to other factors, such as menopause. Women who experience menopause at a younger age are likely to cease sexual activity earlier, partly because menopausal symptoms such as vaginal dryness and decreased libido can make sexual activity less comfortable or desirable [8]. Conversely, women who maintain regular sexual activity are less likely to experience early menopause, indicating a bidirectional relationship between menopause timing and sexual activity cessation [9].

Nevertheless, all previous studies on sexual activity and quality of life in older people were cross-sectional. While the longitudinal association between aging and quality of life (QoL) has been explored in cohorts from countries such as England (English Longitudinal Study of Aging, ELSA) [1] and Ireland (The Irish Longitudinal Study of Aging, TILDA) [2], the specific temporal dynamics of sexual activity cessation and its isolated impact on distinct QoL domains remain underexplored in Central and Eastern European populations. The public health relevance of this study lies in its potential to identify sexual health as a modifiable psychosocial marker for holistic geriatric care. Given the cultural and healthcare-system differences in Poland compared to Western European cohorts, understanding these trajectories adds critical value to cross-cultural gerontology and informs targeted interventions for aging populations. Therefore, the current study will examine changes in sexual activity over two years and their relation to quality of life in older people in Poland.

2. Methods

2.1. Study recruitment

The study recruitment procedure is shown in Fig. S1. Senior daycare centers, public health lectures at Collegium Medicum, senior citizen clubs from Bydgoszcz, and radio and television ads were among the methods used to attract participants. These ads gave people 60 years of age and above the opportunity to take part in in-person health examinations assessing their behavior, general health, and body composition. Individuals under 60 years old were not permitted to participate. No other specific inclusion or exclusion criteria were applied. The study was approved by the ethics committee of Nicolaus Copernicus University, Torun's Ludwik Rydygier Memorial Collegium Medicum (KB 340/2015). Every participant gave us written informed consent. The examination period for participants ran from November 2015 to February 2020. A total of 407 individuals: 95 men and 312 women, took part in the first round of assessments. Of these, 205: 40 men and 165 women, returned for a follow-up examination after two years (Fig. S1). Our previous paper describes the findings of a comparison between re-examined and study dropout individuals [10]. All research was performed according to relevant guidelines/regulations and in accordance with the Declaration of Helsinki.

2.2. Assessment methods

2.2.1. Quality of life measurement

The World Health Organization Quality of Life abbreviated version (WHOQOL-BREF) is a 26-item questionnaire including four domains: physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items); as well as quality of life and general health items [11]. Scores from each of those 4 domains and the total score were analyzed, as well as the difference in score obtained after vs before two years. While an overall WHOQOL-BREF score was calculated for descriptive purposes, the instrument is psychometrically validated to yield four distinct domain scores (Physical, Psychological, Social Relationships, and Environmental). Consequently, our primary inferential analyses focused on the longitudinal changes within these four individual domains rather than a single summed total score, as this aligns with the psychometric structure of the instrument.

2.2.2. Covariates

The following variables were included as covariates in the model: sex, age, and years of education, and the change in marital status over two years was measured. Based on this, a binary variable was created (relationship to single vs other categories). In addition, the change over two years in current health was measured using a subjective scale with a maximum score of 10 points, with 10 representing the greatest possible health. Change in sexual activity over two years was measured, and a binary variable was created, comparing people who were sexually active before and not after two years (stopped) vs. other categories (participants who were active before and after two years, not active before and after, and not active before and active vs after two years). Depression severity was measured by the Geriatric Depression Scale (GDS) [12,13]. Both the WHOQOL-BREF and the Geriatric Depression Scale (GDS) were analyzed as continuous variables to capture the full spectrum of variance in our sample. While the GDS has established clinical cutoffs for identifying depressive syndromes [12,13], the WHOQOL-BREF is designed as a continuous population-level metric and lacks universally established diagnostic cutoffs. Therefore, analyzing the continuous change in scores was deemed the most statistically appropriate approach to evaluate longitudinal trajectories. Occupational status was measured using the following categories: white-collar workers, white-collar workers in managerial positions, owners of craft or entrepreneurial businesses, members of the armed forces or other uniformed services, sellers or employees of trade, farmers operating their farms, blue-collar workers (if qualified), and unskilled laborers were among those included in the initial classification of occupational status. Following that, the last three categories were labeled as “low occupational status” and the remaining categories as “high occupational status”.

2.2.3. Assessment of sexual activity and menopause history

In this study, sexual activity was assessed using a general self-report question asking participants whether they were currently ‘sexually active.’ The survey instrument did not provide a specific clinical definition of sexual activity, nor did it distinguish between different types of sexual behaviors (e.g., penetrative intercourse, non-penetrative intimacy, or solitary activities). Consequently, the classification of participants as sexually active or inactive relies entirely on their subjective interpretation of the term. Data regarding the age of menopausal symptom onset and the age of sexual activity cessation were collected retrospectively using a self-report questionnaire administered during the in-person clinical assessment at the physician's office. Participants were

asked to report the approximate age at which they first experienced menopausal symptoms and the age at which they last engaged in sexual activity. Given the retrospective nature of these items, potential recall bias should be considered when interpreting the reported ages.

2.3. Sample size calculation and power analysis

The current study is a secondary analysis of data gathered in the COPERNICUS study [10]. Given the observational nature of this secondary analysis and the small size of the subgroup that ceased sexual activity ($n = 16$), post-hoc power calculations were deemed inappropriate as they are a direct mathematical function of the obtained p-value. Instead, we emphasize the precision of our estimates by reporting 95% confidence intervals and the upper bounds of epsilon squared for effect sizes, which should be considered when interpreting the robustness of the findings in smaller subgroups [14].

2.4. Statistical analysis

The R environment was used to perform statistical analysis [15]. Utilizing the dependent t-test, the within-group difference was evaluated. Hedges' g was computed along with its confidence interval. The Kruskal-Wallis test was used to investigate differences across groups. The effect size was determined using the epsilon square and its confidence interval. Post-hoc pairwise comparisons were performed using the Dunn test. To address potential regression to the mean, particularly given the small size of the subgroup that ceased sexual activity, we employed an Analysis of Covariance (ANCOVA) framework. Instead of modeling simple change scores, the follow-up WHOQOL-BREF domain scores (Physical, Psychological, Social Relationships, Environmental) and the total score were modeled as the dependent variables. The primary predictor was the change in sexual activity (stopped vs. other categories), while strictly adjusting for the respective baseline WHOQOL-BREF scores alongside demographic and health covariates.

Furthermore, to assess potential overadjustment bias, we conducted sensitivity analyses using nested models. The primary model (Model 1) adjusted for all covariates, including changes in health self-assessment and Geriatric Depression Scale (GDS) scores. A nested model (Model 2) excluded changes in health self-assessment and GDS scores, as these variables may plausibly lie on the causal pathway between sexual activity cessation and quality of life decline. We compared the regression coefficients for the sexual activity change variable between models to evaluate attenuation. All ANCOVA models were evaluated for homogeneity of variances (Levene's test) and normality of residuals (Shapiro-Wilk test). Covariates were selected a priori based on established literature linking demographic, socioeconomic, and health-related factors to QoL trajectories in older adults. To ensure the robustness of the multivariate models, multicollinearity among the selected covariates was assessed using the Variance Inflation Factor (VIF). All VIF values were well below the conservative threshold of 2.5 (maximum VIF = 1.34), indicating that multicollinearity did not unduly influence the regression estimates. The results of the model were graphically shown using SjPlot [16]. The Kolmogorov-Smirnov test was used to verify normality, the Durbin-Watson test was used to assess autocorrelation, and the Goldfeld-Quandt test was used to test the assumptions of heteroskedasticity.

3. Results

3.1. Sample description

A total of 199 subjects (40 males, 159 females; mean age 69.73 ± 6 years) were examined at both baseline and follow-up visits. The sample was predominantly female (80%) and highly educated, with 86% holding high occupational status (Table 1). Baseline characteristics, including depression severity, health self-assessment, and overall quality of life, did not differ significantly between re-examined participants and those lost to follow-up. Detailed demographic and clinical characteristics, including marital status changes and sexual activity transitions, are presented in Table 1. Among participants with available baseline sexual activity data, 39.5% were sexually active. The mean age of sexual activity cessation in women was 58.21 ± 8.7 years, occurring on average 9.41 ± 8.4 years after the onset of menopausal symptoms. Fig. S2 shows the distribution of the difference between the age of menopause and cessation of sexual activity (data were available from 81 women in total).

Table 1
Demographic characteristics of the analyzed sample ($N = 199$). Note: Frequencies for occupational status ($n = 197$) and baseline sexual activity ($n = 195$) do not sum to 199 due to missing data for these specific variables. Four missing baseline values were imputed to retain N=199. Percentages are calculated based on valid (non-missing) responses for each variable.

Variable [unit/level]	Mean ± SD/Count (%)
Age [years]	69.73 ± 6
Sex	
Males	40 (20)
Females	159 (80)
Education [years]	14.39 ± 3.5
Occupational status:	
High employee	170 (86)
Low employee	27 (14)
Marital status binary change:	
Relationship to single	18 (9)
Other	181 (91)
Health self-assessment change [points]	0.22 ± 1.7
GDS change [points]	−0.23 ± 2.6
Sexually active change binary:	
Other	183 (92)
Stopped	16 (8)

GDS-Geriatric Depression Scale.

3.2. Changes in quality of life and their relation to changes in sexual activity status over two years

No statistically significant changes in WHOQOL-BREF score were noticed over two years (60.7 points before vs. 60.3 after two years, $t = 1.03$, $p = 0.3$, Hedges' $g = 0.07$ [−0.07; 0.21]) (Fig. 1). Fig. 2 presents changes in scores of specific domains of WHOQOL-BREF: physical health (panel A), psychological health (panel B), social relationships (panel C), and environmental health (panel D) (Fig. 2). No significant changes were noted in any of these domains (all p-values >0.05).

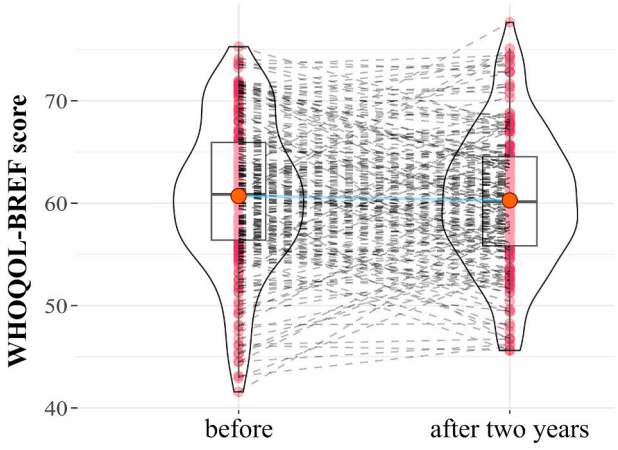

Fig. 1. Changes in the WHOQOL-BREF score before and after two years. Pink dots denote the results of individual patients. Dashed grey lines show the change in individual scores over two years. Orange big dots connected by a light blue line are mean values. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

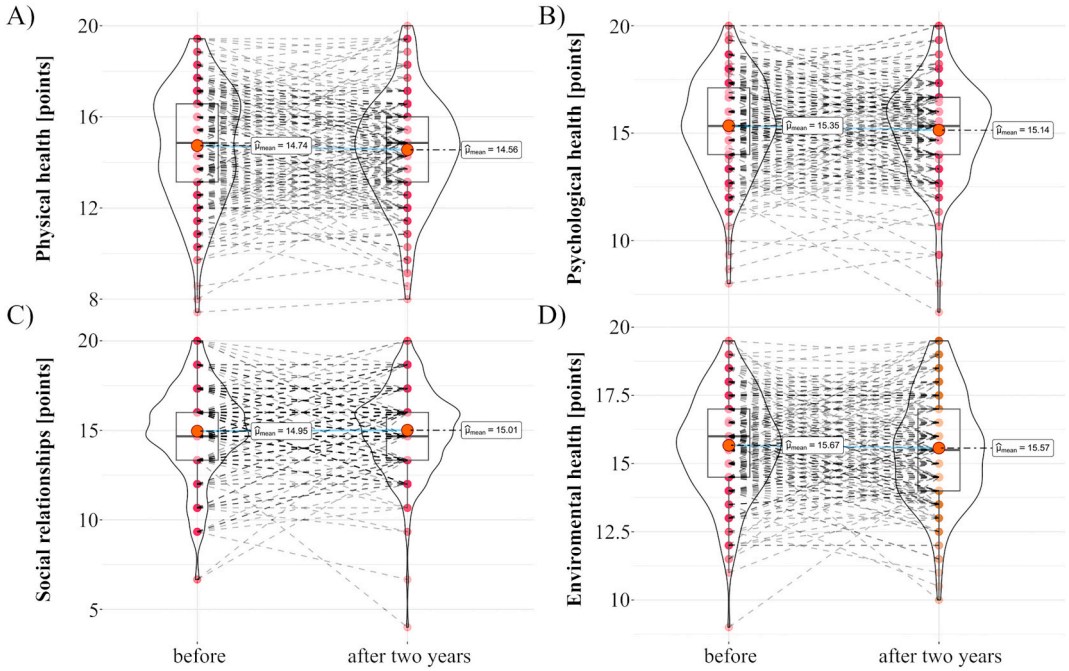

Fig. 2. Changes of WHOQOL-BREF domain scores before and after two years.

Fig. 3 shows the change in WHOQOL-BREF score (follow-up minus baseline), according to change in sexual activity over two years (Ho = 14.03, $p = 0.003$, *epsilon squared* = 0.07 [0.03; 1]. Subjects who were active sexually before and not active after two years ($n = 16$) had a significantly greater decrease in WHOQOL-BREF score after two years (mean ± SD = −5.36 ± 4.9) in comparison to people who remained active sexually (0.52 ± 5.2, $p = 0.003$), in comparison to people who remained not active sexually (−0.41 ± 6.2, $p = 0.006$), and in comparison to people were not active sexually before and active after two years (1.86 ± 4.6, $p = 0.006$).

3.3. Linear model predicting the change in quality of life scale score over two years

ANCOVA models adjusting for baseline scores and covariates revealed that the cessation of sexual activity was significantly associated with lower follow-up scores in the Social Relationships domain (Estimate = −1.66, SE = 0.59, $p = 0.006$) and the Environmental domain (Estimate = −1.42, SE = 0.52, $p = 0.007$), as well as the overall WHOQOL-BREF total score (Estimate = −4.96, SE = 1.78, $p = 0.006$). The Physical and Psychological domains did not reach statistical significance in the fully adjusted models ($p = 0.294$ and $p = 0.057$, respectively). Full model outputs are provided in Supplementary Tables 1 and 2.

To address potential overadjustment, nested models excluding changes in health self-assessment and GDS scores were examined. The association between sexual activity cessation and the Social Relationships domain remained robust and virtually unchanged (Estimate = −1.53, SE = 0.56, $p = 0.007$). Similarly, the effect on the Environmental domain slightly strengthened (Estimate = −1.55, SE = 0.49, $p = 0.002$), as did the effect on the total WHOQOL-BREF score (Estimate = −5.17, SE = 1.68, $p = 0.002$). Notably, in the nested model, the Psychological domain also reached statistical significance (Estimate = −1.27, SE = 0.58, $p = 0.030$). These findings indicate that the observed declines in quality of life are not artifacts of overadjustment by potential mediating health and mood variables. Full model outputs, including overall model fit and assumption checks, are provided in Supplementary Table S1. The consolidated estimates for the primary predictor across all domains are detailed in Supplementary Table S2.

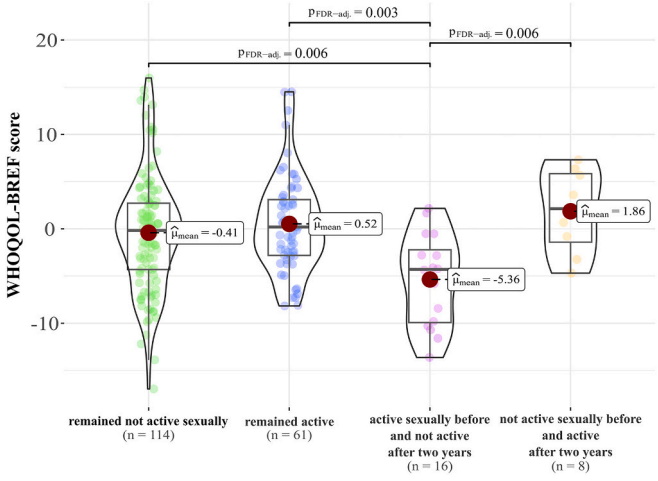

Fig. 3. Change in WHOQOL-BREF score (follow-up minus baseline) in relation to changes in sexual activity status over two years.

4. Discussion

In the current study, we found that older people who ceased sexual activities experienced a decrease in QoL over two years, particularly in the domain of social relationships. While previous literature indicates that QoL generally declines with advancing age [1,2,5,17], these trajectories are nuanced and influenced by factors such as frailty [18] and geographic context [19]. Our findings highlight that the cessation of sexual activity is a specific temporal marker associated with accelerated declines in psychosocial well-being, beyond what is expected from normal aging alone.

Furthermore, while demographic and health factors like sex, education, employment, and self-perceived health are established correlates of QoL [1,17,20,21], the cessation of sexual activity may act as a profound psychosocial event. Following the stereotype embodiment model [22], losing sexual function or desire might trigger internalized ageist stereotypes (e.g., perceiving oneself as “old” or “useless”), thereby

negatively impacting psychological and social well-being. This process may be particularly pronounced in older men due to maladaptive beliefs about masculinity and aging [23].

Consistent with our results, Jackson et al. [24] found that a decline in sexual desire or frequency was linked to higher depressive symptoms and lower QoL. Several mechanisms may explain this association. First, sexual activity promotes the release of endorphins, fostering happiness and mitigating depression. Second, an active sex life often strengthens romantic partnerships, boosting life satisfaction and social relationship quality. Third, fulfilling sexual activity may improve self-efficacy and self-esteem. Additionally, being sexually active may serve as an indirect indicator of overall good physical health, which positively relates to QoL trajectories [25].

Regarding female participants, the mean age of sexual activity cessation was 58.21 years, occurring on average 9.41 ± 8.4 years after the onset of menopausal symptoms (mean age 49.27). This aligns with previous clinical observations showing a decline in sexual intercourse in the fifth decade of life. These findings suggest that sexual activity should not be treated merely as a binary variable. Future studies should further examine the nuanced relationship between the age of menopause and the cessation of sexual activity, as physiological changes such as vaginal dryness might influence the reduction of pleasure and intercourse frequency.

These findings have significant implications for public health and clinical practice. The observed decline in quality of life, particularly in social relationships and environmental well-being, following the cessation of sexual activity highlights the need to integrate sexual health assessments into routine geriatric care. Healthcare providers should be trained to approach the topic of sexuality with older adults in a sensitive, non-judgmental manner, overcoming personal and societal ageist biases. Routine geriatric assessments should include brief sexual health screenings, as the cessation of sexual activity may serve as an early psychosocial marker for declining well-being or unmet relational needs. Furthermore, public health initiatives should aim to destigmatize late-life sexuality, promoting educational campaigns that challenge ageist stereotypes and encourage open communication between older adults and their healthcare providers regarding sexual health and intimacy.

Several limitations should be acknowledged. First, sexual activity was categorized as a binary variable, which does not capture important nuances such as frequency, type of activity, or relationship context [26,27]. Because our survey utilized a general question, we cannot determine if some older adults transitioned from penetrative intercourse—hindered by age-related changes like genitourinary syndrome of menopause (GSM) or erectile dysfunction—to non-penetrative forms of intimacy [28,29]. Consequently, we cannot ascertain whether the observed QoL decline is driven by a complete cessation of all intimate contact or specifically the loss of penetrative sex. Additionally, we lacked comprehensive data on metabolic syndrome [30], which represents an unmeasured confounder that could independently affect both sexual function and QoL. Second, the observational design precludes causal inference; unmeasured confounders such as medication use or cardiovascular status may independently influence both variables. Third, the sample was predominantly female (80.5%), limiting male-specific inference. Fourth, the subgroup who ceased sexual activity was relatively small ($n = 16$), warranting cautious interpretation. Fifth, our 'marital status' variable only captures formal relationship dissolution and does not account for adverse dyadic events (e.g., a partner's severe illness), leaving unmeasured partner-related confounding as a plausible alternative explanation for the QoL decline [31,32]. Finally, reliance on self-reported measures introduces potential recall and social desirability bias. Future longitudinal studies with larger, sex-balanced samples and dyadic data are needed to clarify these complex associations.

5. Conclusions

This two-year longitudinal study indicates that older adults who cease sexual activity experience a significant decline in overall quality of life, particularly in the social relationships domain, compared to those who maintain or initiate sexual activity. These temporal associations highlight the potential value of integrating sexual health assessments into routine geriatric care to support holistic well-being in aging populations. Future research should employ more granular measures of sexual activity and dyadic data to further clarify these complex longitudinal relationships. Routine geriatric assessments should include brief sexual health screening, as cessation may serve as an early marker of declining psychosocial well-being or unmet relational/health needs.

Contributors

Agnieszka Kujawska participated in conceptualization, data curation, investigation, methodology, project administration, supervision, validation, and drafting and editing of the paper.

Sławomir Kujawski participated in conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization, and drafting and editing of the paper.

André Hajek participated in revision and editing of the paper.

María del Sequeros Pedroso-Chaparro participated in revision and editing of the paper.

Jakub Husejko participated in investigation and revision of the paper.

Weronika Hajec participated in data curation, investigation, and revision of the paper.

Paweł Zalewski participated in resources, supervision, validation, and revision of the paper.

Kornelia Kędziora-Kornatowska participated in resources, supervision, validation, and revision of the paper.

All authors saw and approved the final version and no other person made a substantial contribution to the paper.

Ethical approval

The study was approved by the ethics committee of Nicolaus Copernicus University, Torun's Ludwik Rydygier Memorial Collegium Medicum (KB 340/2015) and was performed in accordance with the Declaration of Helsinki.

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Data sharing and collaboration

There are no linked research data sets for this paper. The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declaration of competing interest

The authors declare that they have no competing interest.

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