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Effect of diet, vitamin D3 and other factors on genital prolapse recurrensce

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ABSTRACT

This study addresses the pressing need for further investigation into risk factors contributing to genital prolapse recurrence, with a focus on factors like younger age and body mass index (BMI) that have been confirmed in the literature. Conducted as a cross-sectional study involving 300 post-operative cases of genital prolapse patients, the case groups comprising 210 individuals received regular gynecological check-ups every six months during the initial five years post-surgery, followed by annual visits, wherein lifestyle, diet, and laboratory values were monitored and adjusted. In contrast, the control group (90 patients) did not undergo post-operative gynecological follow-up. The results indicate that weight lifting, heavy physical work, menopause, constipation, insufficient protein intake, diseases associated with prolonged cough, and BMI are strongly associated with the likelihood of recurrent genital prolapse, while a weight reduction of 5 kg or more exhibits a protective effect ($p<0.001$). The established regression model proves statistically significant, explaining 84.1% of genital prolapse recurrence factors, with a sensitivity of 84.8% and specificity of 98.8%. These findings emphasize the importance of postoperative lifestyle monitoring, nutritional guidance, and immune support to reduce the risk of genital prolapse recurrence.

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1. INTRODUCTION

Pelvic or genital prolapse is defined by herniation of the pelvic organs (urethra, cervix or uterine body, anterior wall of the rectum, bladder) into the vaginal lumen or outside the vaginal opening. It is one of the leading providers of surgical care in gynaecology [1]–[3]. The prevalence of the disease is increasing, and therefore the necessity for surgical intervention will increase [4], [5]. Despite the availability of conservative treatments for genital prolapse, the lifetime risk of reoperation for women who have undergone surgery for pelvic organ prolapse is between 10% and 20% [6]. A well-known factor in the development of prolapse is the genetic weakness of connective tissue. In addition, birth trauma, lifestyle, nutrition, and many other factors influence the development of primary prolapse [7], [8].

Kazakhstan has made significant progress in studying the problem of internal genital prolapse and prolapse. However, due to the limited number of studies on surgical correction methods, many questions remain unresolved. However, according to the study, the main factor contributing to the development of genital prolapse in Kazakhstan is heavy physical labor, natural childbirth, and anatomical damage to the genital tract during childbirth [9].

Most research has focused on risk factors for primary prolapse. Not many studies can be found on the risk factors for genital prolapse recurrence after treatment. A recent meta-analysis found an effect of younger age and preoperative prolapse stage on recurrence [2], [10], [11]. Other sources point to smoking, body mass index (BMI), and a vegetarian diet as factors in relapse, and consumption of soy products and vaginal intercourse as protective factors against relapse [12]–[15]. Several studies have evaluated the relationship between vitamin D3 deficiency and pelvic floor dysfunction and the therapeutic effect of supplementation, but the role of vitamin deficiency on recurrence has not been indicated [16]–[21]. There is evidence of nutrients affecting collagen development, including hormone therapy, and evidence of collagen glycoxidation as a factor impairing its structure [22]–[26]. In addition, some studies have evaluated the role and use of mesh prostheses, the prevention of constipation, prolonged coughing, and weight loss as protective against prolapse [27]–[31].

Very frequently, an anatomical prolapse is not accompanied by symptoms. In particular, [32] demonstrate that one year after surgery, recurrence was detected anatomically in 45% of patients and symptomatically in only 7%. In this case, therefore, periodic check-ups are essential. The most common treatment for apical compartment prolapses is the fixation of the sacrospinous ligament. Such surgery is successful in 67-93% of cases, but there is a 7% recurrence of anterior vaginal wall prolapse. A complication of the procedure can be an enlargement of the genital opening (larger than 4 cm). The latter phenomenon is strictly associated with prolapse recurrence. In particular, the best outcome in terms of reduced recurrence rate is observed in patients with a postoperative genital opening diameter of less than 3 cm [33]. However, the role of these factors in the prevention of genital prolapses and its recurrence is not clear, and one can only speculate about the probable impact. All of the studies emphasize the necessity for further research [34]. The introduction of prognostic models into clinical practice is important for the health care system to identify women at increased risk of genital prolapse and its recurrence. It will be important in assessing the risks of surgery and informing patients about likely outcomes and possible treatment failures [35], [36]. Considering these data, all the described risk factors for primary prolapse and its recurrence that could be gathered from the probability of recurrence questionnaire were included.

The aim of this study is to investigate pelvic prolapse recurrence risk factors and predictors post-surgery while assessing the efficacy of post-operative monitoring and lifestyle interventions. The tasks of the study are to assess demographic and medical characteristics, evaluate pelvic prolapse severity, analyses post-operative symptoms, compare laboratory values. Also, the authors develop a prognostic model, establish prevention thresholds, determine predictive model thresholds, and emphasize the importance of post-operative care.

2. METHOD

At the Figure 1, it provides a comprehensive overview of study sample. Patients in both groups completed a questionnaire using two surveys. Quality of life was assessed using a valid Pelvic Organ Prolapse Quality of Life (P-QOL) survey adapted for women in Kazakhstan [35]. The identification of risk factors in both groups, preventive measures are taken and treatment outcomes was conducted by the authors of the study on the basis of a self-developed questionnaire “monitoring the identification of postoperative outcomes (MVPI)”, Author’s Certificate No. 23610, dated 15.02.2022. All patients were examined on a gynaecological chair for recurrence of genital prolapse after completing informed voluntary consent [37]. The presence of genital prolapses and its manifestations were assessed objectively during the examination with a grade of genital prolapse according to the Pelvic Organ Prolapse Quantification (POP-Q) classification.

The presence of functional disorders of the bladder and rectum (urinary incontinence, difficult urination, faecal and gas incontinence) was assessed during the examination with functional tests. Urinary frequency was ranked as follows: “less than 8 times a day” was not considered frequent urination, “8-15 times a day” and “more than 15 times a day” were ranked as frequent. The presence of constipation was defined as follows: “daily” was accepted as the standard, “once every two days”, and “less than once every two days” was considered constipation. Mesh erosion was assessed as no erosion; less than one centimetre, and more than one centimetre. The nature of the discharge is assessed objectively on examination: colour, odour, and presence of blood. Next, P-QOL questionnaires were completed to assess the quality of life and a questionnaire “monitoring the identification of postoperative outcomes” to assess the presence of risk factors for prolapse and symptoms. The assessed treatment efficacy endpoints include the absence of anatomical prolapse as determined by POP-Q, the absence of prolapse symptoms, and the level of quality of life.

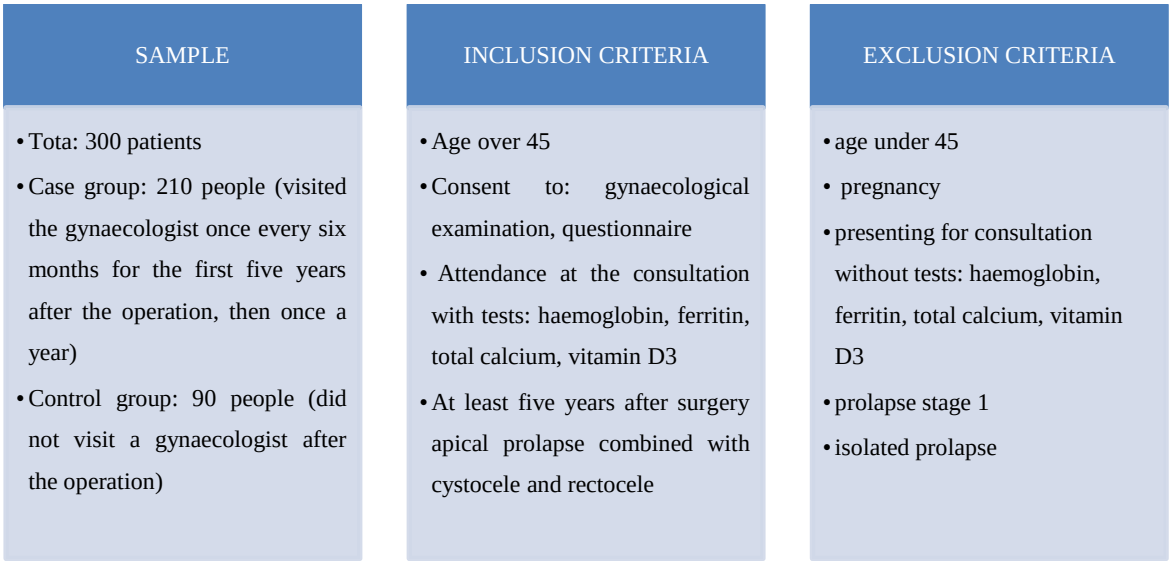

Figure 1. Study's sample

Statistical analysis, the authors analysed the data collected in SPSS-statistic 26. The Kolmogorov-Smirnov criterion was used to test for the regularity of the distribution of the measured variables. Quantitative data analysed Mann-Whitney U-test, t Student's test, Fisher exact test was used for nominal data, Chi–pearson's square. Spearman's rank correlation coefficient was used to assess the correlation between exercise commitment and age, and the closeness of the relationship was established using the Chaddock scale. To predict the risk of developing pelvic organ prolapse regarding weight lifting in kg, the authors conducted a Roc-analysis, setting a cut-off point threshold with sensitivity and specificity determinations. Binary logistic regression analysis was used to estimate the effect of all factors on the chance of recurrence of pelvic prolapse, and the coefficient of determination was estimated using the Nagelkerke method. The level of statistical significance was defined as $p<0.05$.

3. RESULTS

During the cross-sectional study of 300 post-operative cases of genital prolapse, we found that the average age at which symptoms of genital prolapse first appeared was 58.3±2.0 years. It is noteworthy that a substantial proportion of these patients were engaged in varying degrees of physically demanding occupations. Analyzing the nature of their occupational activities, it was observed that 20 (24.0%) of the women were engaged in work associated with non-normalized physical loads, such as construction work, cooking, or agricultural tasks, for an extended period. Work involving moderate physical exertion was performed by 59 (49.1%) patients. Interestingly, 35.0% of women, whose occupational activities did not involve heavy physical exertion, experienced similar workloads at home, such as caring for young children, working in a summer cottage, living in a private house, and managing household chores.

Traumatic injuries played a significant role in the etiopathogenesis of genital prolapse development. Additionally, childbirth was identified as a crucial factor, with all women with genital prolapse having given birth, and 75.0% of them having had two or more deliveries. The median number of births was 2, with a maximum of 4. Patients with prolapse had a history of three or more births nearly five times more frequently than women without genital prolapse. Both groups were comparable for age ($p=0.360$), menopause ($p=0.391$) and the number of births ($p=0.360$), the differences between these measures were not statistically significant as shown in Table 1.

The presence and degree of birth trauma in the history of birth were statistically significantly different, the strength of the relationship being medium ($p<0.001$). Preoperative prolapse stage structure was not statistically different between the groups, and the strength of the relationship was weak ($p=0.550$). The groups varied statistically significantly according to the surgical treatment used, the strength of the relationship being medium ($p<0.001$). Differences in pelvic floor exercise between groups were statistically significant with a strong correlation, ($p<0.001$), but only 21.4% regularly exercised in the case group, which had an inverse statistically significant correlation on the Chaddock scale with age, the older the age, the less commitment to exercise r_{xy}=(-)0.720 ($p=0.001$). Myostimulation with an individual portable device was not used in the control group, only 11.4% in the case group ($p=0.001$). Hormone replacement therapy was provided to two patients in the case group

(1%), the strength of the association was weak and the differences were not statistically significant (p=0.353). Pessaries were used by the control group in 2 cases (2.2%), the strength of the association was weak and the differences were statistically significant (p=0.03). There were statistically significant differences in using mesh prostheses between the groups, and the strength of the relationship was medium (p<0.001). The estimated laboratory values were statistically significantly different in both groups in haemoglobin (p<0.001), ferritin (p<0.001), total calcium and vitamin D3 (p=0.025) as presented in Table 2.

The median and interquartile range were statistically significantly different in the two groups, the case group–6.2(1), and the control group–8(1) (p<0.001). For symptoms of mesh erosion (p=0.269) and history of mesh excision (p=0.933). There were no statistically significant differences between the groups as shown in Table 3.

Table 1. Anamnesis data

Estimated result	Results	Case group	Control group	p-value	Effect size
Menopause	No	52 (24.8%)	23 (25.6%)	0.391***	0.1**
	One year or less	28 (13.3%)	10 (11.1%)		
	More than one year to five years	19 (9.0%)	14 (15.6%)		
	More than five years	111 (52.9%)	43 (47.8%)		
Birth trauma	No	35 (16.7%)	49 (54.4%)	<0.001*	0.387**
	1st degree	72 (34.7%)	20 (22.2%)		
	2nd degree	59 (28.1%)	12 (13.3%)		
	3rd degree	41 (19.5%)	9 (10%)		
Stage of prolapse to	2nd degree	24 (11.4%)	14 (15.6%)	0.550*	0.063**
	3rd degree	152 (72.4%)	64 (71.1%)		
	4th degree	34 (16.2%)	12 (13.3%)		
Operation	PF+AVP+PVP	58 (27.6%)	21 (23.3%)	<0.001***	0.313**
	PF+AM+PVP	82 (39%)	15 (16.7%)		
	HE+AM+PVP	41 (19.5%)	29 (32.2%)		
	PF+AM+PVP	21 (10%)	10 (11.1%)		
	VF+AVP+PVP	5 (2.4%)	6 (6.7%)		
	HE+AVP+PVP	3 (1.4%)	9 (10.0%)		
Exercises	No	58 (27.6%)	80 (88.9%)	<0.001***	0.565**
	Less than once a week	85 (40.5%)	7 (7.8%)		
	1-2 times a week	22 (10.5%)	2 (2.2%)		
	At least 3 times a week	45 (21.4%)	1 (1.1%)		
Myostimulation	No	186 (88.6%)	90 (100%)	0.001***	0.193**
	Yes	24 (11.4%)	0		
Hormone replacement therapy	No	208 (88.6%)	90 (100%)	0.353***	0.054**
	Yes	2 (1%)	0		
Pessaries	No	210 (100%)	88 (97.8%)	0.030***	0.125**
	Yes	0	2 (2.2%)		
Fitting a mesh prosthesis	No	8 (3.8%)	15 (16.7%)	<0.001***	0.221**
	Yes	202 (96.2%)	75 (83.3%)		
Age	Me (Q1-Q3)	57 (18)	54 (13)	0.360****	
Number of births	Me (Q1-Q3)	2 (1)	2 (1)	0.921****	
Number of years after surgery at the time of examination	Me (Q1-Q3)	6.2 (1)	8 (1)	<0.001****	

Note: Me: median; Q1-Q-3: interquartile range; Chi: Pearson square*; V: Cramer**; Fisher exact test***; Mann-Whitney U-test****; PF: Promontofixation; VF: Venterofixation; HE: hysterectomy; AM: anterior mesh; AVP: anterior vaginoplasty; PVP: posterior vaginoplasty.

Table 2. Laboratory indicators

Estimated result	Results	Case group	Control group	p-value
Haemoglobin, g/l	M (±SE)	128.65 (±10.389)	120.01 (±12.047)	<0.001*****
Ferritin, mcg/l	Me (Q1-Q3)	19.52 (±14.150)	12.05 (±10.630)	<0.001****
Total calcium. μmol/l	Me (Q1-Q3)	2.31 (±0.200)	2.3 (±0.260)	0.025****
Vitamin D3, ng/ml	Me (Q1-Q3)	36 (±9)	26 (±11)	0.025****

Note: M: mean; Me: median; SD: standard deviation; Q1-Q-3: interquartile range; Mann-Whitney U-test****; t Student's test*****.

Table 3. Outcomes of operations

Estimated result	Results	Case group	Control group	p-value	Effect size
Menopause	No	52 (24.8%)	23 (25.6%)	0.391***	0.1**
	1 year or less	28 (13.3%)	10 (11.1%)		
	More than one year to five years	19 (9.0%)	14 (15.6%)		
	More than five years	111 (52.9%)	43 (47.8%)		
Birth trauma	No	35 (16.7%)	49 (54.4%)	<0.001*	0.387**
	1st degree	72 (34.7%)	20 (22.2%)		
	2nd degree	59 (28.1%)	12 (13.3%)		
	3rd degree	41 (19.5%)	9 (10%)		
Stage of prolapse to	2nd degree	24 (11.4%)	14 (15.6%)	0.550*	0.063**
	3rd degree	152 (72.4%)	64 (71.1%)		
	4th degree	34 (16.2%)	12 (13.3%)		
Operation	PF+ AVP +PVP	58 (27.6%)	21 (23.3%)	<0.001***	0.313**
	PF + AM+PVP	82 (39%)	15 (16.7%)		
	HE+AM+PVP	41 (19.5%)	29 (32.2%)		
	PF+ AM+PVP	21 (10%)	10 (11.1%)		
	VF+AVP+PVP	5 (2.4%)	6 (6.7%)		
	HE+AVP+PVP	3 (1.4%)	9 (10%)		
Exercises	No	58 (27.6%)	80 (88.9%)	<0.001***	0.565**
	Less than once a week	85 (40.5%)	7 (7.8%)		
	1-2 times a week	22 (10.5%)	2 (2.2%)		
	At least 3 times a week	45 (21.4%)	1 (1.1%)		
Myostimulation	No	186 (88.6%)	90 (100%)	0.001***	0.193**
	Yes	24 (11.4%)	0		
Hormone replacement therapy	No	208 (88.6%)	90 (100%)	0.353***	0.054**
	Yes	2 (1%)	0		
Pessaries	no	210 (100%)	88 (97.8%)	0.030***	0.125**
	yes	0	2 (2.2%)		
Fitting a mesh prosthesis	No	8 (3.8%)	15 (16.7%)	<0.001***	0.221**
	Yes	202 (96.2%)	75 (83.3%)		
Age	Me (Q1-Q3)	57 (18)	54 (13)	0.360****	
Number of births	Me (Q1-Q3)	2 (1)	2 (1)	0.921****	
Number of years after surgery at the time of examination	Me (Q1-Q3)	6.2 (1)	8 (1)	<0.001****	

Note: Me: median; Q1-Q-3: interquartile range; Pearson Chi-square*; V-Cramer**; Fisher's exact test***; Mann-Whitney U-test****.

The authors developed a predictive model to determine the probability of relapse as a function of risk factors by binary logistic regression. The following risk factors were included in the model: age, method of surgery, use of mesh prosthesis, BMI, number of years post-menopause, weight gain shortly after surgery, diseases accompanied by prolonged cough, weight lifting, heavy physical work, high sugar intake, protein food intake, constipation, smoking, blood ionised calcium levels, vitamin D3 levels, haemoglobin levels, ferritin levels, mesh prosthesis excision (for mesh erosion), hormone replacement therapy. The observed dependence was described by (1-2):

$$P = 1/(1 + ez) * 100\% \quad (1)$$

$$Z = -1.06 + 1.852 * Xsm + 2.413 * \mathrm{X}HL - 0.173 * XVD3 + 1.001 * Xmen + 1.263 * XConst - 2.992 * XWL + 1.277 * XProtein + 0.721 * XCarb + 0.291 * XBMI \quad (2)$$

where, p is the probability of developing prolapse recurrence (%); X_{sm} is smoking (0 is none, 1 is rarely, 2 is up to 5 cigarettes a day, 3 is half a pack a day, 4 is pack a day); X_{HL} is heavy lifting (0 is none, 1 is single episode, 2 is sometimes, 3 is often); $X_{V\ D3}$ is vitamin D3 level (ng/ml); X_{men} is duration of menopause (0 is none, 1 is 1 year or less, 2 is more than one year to five years, 3 is more than 5 years); X_{Const} is constipation (0 is none, 1 is single episode, 2 is sometimes, 3 is always); X_{WL} is weight loss by 5 kg or more in a short period (0 is none, 1 is 5 kg or less, 2 is more than 5 kg); $X_{Protein}$ is protein food intake at the rate of 1.2 grams per 1 kg

of weight (0 is none, 1 is very rarely, 2 is sometimes, 3 is regularly); X_{Carb} is carbohydrate intake over 25 grams per day (0 is none, 1 is occasional, 2 is sometimes, 3 is often); X_{BMI} is BMI (kg/m^2).

The obtained regression model is statistically significant (p<0.001). Based on Nagelkerke's coefficient of determination, the model accounts for 84.1% of the factors determining the probability of genital prolapse recurrence as shown Table 4. Based on the value of the regression coefficients, heavy lifting, duration of menopause, constipation, low protein intake, high carbohydrate intake, and BMI have a strong correlation with the probability of genital prolapse recurrence. Predictors such as vitamin D3 levels and a decrease in body weight of 5 kg or more were inversely associated with the development of prolapse recurrence. The characteristics of each of the factors are presented in the table. The sensitivity of the model was 84.8%, the specificity 98.8%. Diagnostic efficiency was 84.7%. The odds ratio for each of the factors and the CI are presented in Figure 2.

Table 4. Risk factors for recurrence of genital prolapse

Predictors	Unadjusted		Adjusted		
	OR, 95% CI	p-value	Exp (B), 95% CI	B	p-value
Smoking (SM)	3.248 (2.025-5.210)	<0.001	6.375 (2.427-16.742)	1.852	<0.001
Heavy lifting (HL)	16.839 (7.305-38.818)	<0.001	11.166 (2.223-56.091)	2.413	0.003
Vitamin V D3 level	0.882 (0.843-0.923)	<0.001	0.84 (0.747-0.945)	-0.0173	0.004
Menopause (Men)	2.154 (1.474-3.146)	<0.001	2.72 (1.286-5.755)	1.001	0.009
Constipation (Const)	4.123 (2.656-6.401)	<0.001	3.535 (1.336-9.355)	1.263	0.011
Reduction in body weight by 5 kg or more (WL) in a short period	1.338 (0.712-2.515)	0.366	0.05 (0.008-0.300)	-2.992	0.001
Insufficient consumption of protein food (Protein)	5.978 (3.667-9.746)	<0.001	3.588 (1.431-8.997)	1.277	0.006
Consumption of large quantities of carbohydrates (Carb)	4.384 (2.816-6.826)	<0.001	2.058 (0.887-4.771)	0.721	0.093
BMI	1.16 (1.068-1.260)	<0.001	1.338 (1.120-1.599)	0.291	0.001
Sensitivity			84.8%		
Specificity			98.8%		
Total percentage			84.7%		
Nagel Kerke's R-square			0.841		
p-value			0.001*		

Note: B – coefficient; Exp (B) – odds ratio; Chi–pearson square; CI–confidence interval; "Unadjusted" presents the association between each predictor and the outcome variable without considering other factors; "Adjusted" takes into account potential confounding variables to provide a more refined understanding of the relationships.

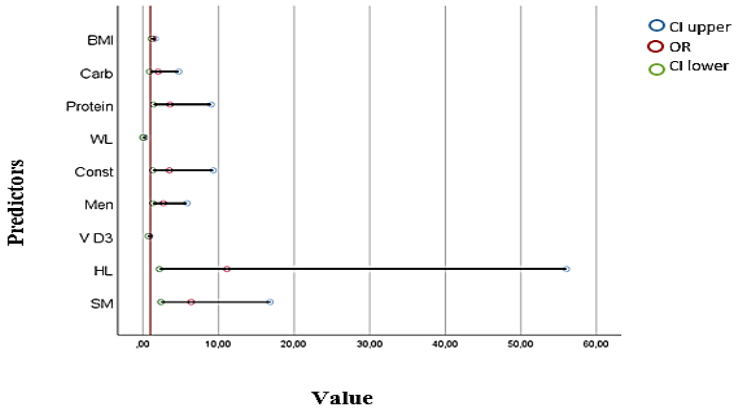

Figure 2. Predictors of recurrence of pelvic prolapse

The outcome is significantly associated with smoking, heavy lifting, menopause, constipation, insufficient protein consumption, and BMI, with varying strength of these relationships in the adjusted analysis. Higher levels of Vitamin D3 are consistently associated with reduced odds of the outcome. Weight loss is not significant in the unadjusted analysis but shows a strong inverse relationship in the adjusted analysis. Caution is necessary when interpreting the significance of high carbohydrate consumption after adjustment. The model's robust performance metrics underscore the strong relationship between these predictors and the outcome, highlighting their potential importance in a clinical or epidemiological context.

The area under the receiver operating characteristic (ROC) curve corresponding to the relationship between the prognosis of genital prolapse recurrence after surgical treatment and the value of the logistic

regression function was 0.989±0.005 with 95% CI: 0.980-0.998. The resulting model was statistically significant (p<0.001). The threshold value of the function P (1) at the cut-off point was 0.07. Functional values equal to or greater than this value was predictive of genital prolapse recurrence after surgical treatment. The sensitivity and specificity of the method were 95.7% and 91.3% respectively. The threshold for permissible heavy lifting in kg has been determined. The area under the ROC-curve corresponding to the relationship between the risk of genital prolapse recurrence and heavy lifting in kg was 0.836±0.043 with 95% CI: 0.751-0.922. The resulting model was statistically significant (p<0.001).

The permissible heavy lifting threshold in kg at the cut-off point is 4.75 kg. Lifting heavier than this will increase the risk of relapse. The sensitivity and specificity of the method were 67.4% and 95.3% respectively. Vitamin D3 is crucial for bone health, muscle function, and the immune system. It may indirectly impact the risk of genital prolapse recurrence through various mechanisms [38]. Firstly, it supports muscle strength and connective tissue integrity in the pelvic region, reducing the risk of pelvic floor weakness, a primary contributor to prolapse. Secondly, it can help regulate the immune response, potentially reducing chronic inflammation in the pelvic area, which is associated with prolapse development. Vitamin D's influence on hormone levels may contribute to maintaining pelvic floor muscle tone and tissue elasticity, particularly during menopause, potentially reducing the risk of recurrence [39], [40].

4. DISCUSSION

Data from a 2022 meta-analysis identified younger age and preoperative stage of prolapse as significant risks of prolapse recurrence. Some data included in the meta-analysis suggest an effect of BMI on the rate of reoperation for prolapse. The same meta-analysis reported that the presence of smoking had a protective role against relapse [2]. In contrast, in another earlier study, smoking increased the risks of relapse, including BMI [10]. In this prognostic model, smoking increases the chance of recurrence by 6.4 times (95% CI: 2.427-16.742), an increase in body mass index by 1 kg/m^2 increases the chance of genital prolapse recurrence by 1.3 times (CI: 1.120-1.599). However, the preoperative prolapse stage had no statistically significant effect on the probability of prolapse recurrence. The role of mesh prostheses in protecting against recurrence is not entirely clear, although a fair amount of data has been reported on reduced recurrence when using mesh, and there is evidence that there was no difference between using mesh compared to native tissue or biological grafts [39]. In this prognostic model, there was no statistically significant effect of using mesh prostheses compared to native tissue surgery. In addition, there was no effect of the surgical technique chosen, although some evidence suggests an effect of surgical tactics on the probability of prolapse recurrence [28].

Vegetarianism was a risk factor for recurrence, whereas frequent consumption of soy products and vaginal intercourse after surgery can reduce recurrence. In addition, some nutrients can influence collagen development in studies [21]. In this prognostic model, irregular consumption of protein (less than 1.2 grams per 1 kg body weight) contributed 3.6 times to the odds of relapse (95% CI: 1.431-8.977), but the effect of protein intake cannot be unequivocally estimated from the authors, as the evaluation from the questionnaire is highly subjective. There is insufficient evidence for the effect of hormone replacement therapy on tissue properties, but in this research, there was no protective effect of hormone replacement therapy (HRT) on relapse. The role of Vitamin D can be promising in relapse prevention. Many studies have demonstrated a correlation between skeletal muscle weakness and low vitamin D concentrations, including an association with pelvic floor dysfunction, and a reduction in prolapse symptoms with vitamin D supplementation [12]. In this model, normalization of vitamin D3 levels reduces the chance of recurrence by a factor of 1.9 (95% CI: 0.747-0.945), which could affect connective tissue strength. There are some studies on the disruption of collagen structure, due to its glycolisation [25]. Consumption of more than 25 grams of carbohydrates per day increases the chance of relapse by 2.058 (CI: 0.887-4.771). However, the assessment of carbohydrate intake is quite subjective and rather has an impact on weight gain, although the authors did include this recommendation for women to prevent relapse.

Comprehensive treatment of other risk factors could serve as a comprehensive prolapse prevention intervention [41], [42]. For example, preventing actions that increase intra-abdominal pressure, such as prolonged coughing, lifting weights, and constipation. Widespread treatment of intestinal dysbiosis, and chronic constipation, has not been confirmed in large studies [30]. Weight loss through diet or bariatric surgery is suggested as a preventive measure. Some studies have confirmed the effect of weight loss on improving prolapse symptoms, but no statistically significant improvement has been observed in studies using objective quantitative methods of prolapse assessment [31]. In this model, a decrease in body weight of 5 kg or more contributed to a 2-fold reduction in the chance of relapse (95% CI: 0.008-0.3), and constipation increased the chance of relapse by 3.535 times (95% CI: 1.336-9.355). A 2022 meta-analysis identified the effect of younger age on recurrence. However, the authors did not include women younger than 45 years of age, which probably influenced the lack of effect of age, but with an increase of one year in the duration of menopause, there was a 2.7-fold increased chance of recurrence (95% CI: 1.286-5.755). The diagnostic efficiency of this model was

84.7%. Lifting more than 5 kg increases the chance of relapse by a factor of 11.12 (95% CI: 2.233-56.091). In addition, the authors defined a permitted weight-bearing capacity of 4.75 kg, with a sensitivity and specificity of 67.4% and 95.3% respectively, whereas no similar recommendations for maximum permitted weight-bearing capacity have been observed.

The authors acknowledge some shortcomings of the study. Definitely, to assess risk factors it is necessary to schedule studies with a different research design: randomized controlled trials, and cohort studies on larger samples of subjects. In this study, only the presence of a recurrence of prolapse, its symptoms and laboratory values at the time of examination are objectively assessed. The influence of factors, adherence to preventive measures and the impact of changes in laboratory values over time cannot be assessed objectively. All data is obtained from questionnaires and subjective patient assessments. The impact of pelvic floor exercises and myostimulation could not be assessed as there were almost no patients regularly committed to these procedures.

5. CONCLUSION

The findings of this study indicate that variables such as age, duration of menopause, and parity did not exhibit any significant statistical differences between the experimental and control groups. About 70% of patients had stage III pelvic prolapse at the time of surgery. Relapses of varying severity occurred in 3% of group 1 patients and 43% of group two patients. The most common anatomical appearance of recurrence was cystocele. The laboratory values of the patients who were periodically followed up by a gynaecologist were statistically significantly different from those of the non-visiting sample in the post-operative period: the represents of the case group had higher values of haemoglobin, ferritin and vitamin D3. All the patients in the case group and 58% of the control group improved their general well-being. According to the regression coefficients of the prognostic model for risk factors for recurrence, these include: duration of menopause; excessive vigorous exercise; insufficient protein intake and excessive carbohydrate intake; body mass index The strength threshold should be 4.75 kg lifting. Sufficient vitamin D3 levels and a weight loss of 5 kg or more can, in turn, prevent a relapse. The threshold value of the function P (1) at the cut-off point was determined to be 0.07 for the resulting predictive model. The sensitivity corresponding to the proportion of prolapse recurrence was 95.7%, and the specificity corresponding to the proportion of cases without pelvic prolapse was 91.3%. This threshold value can be used in clinical practice to assess the risk of prolapse recurrence using this prognostic model.

The results suggest that regular post-operative monitoring by a physician, monitoring the patient's lifestyle, nutrition and laboratory parameters is necessary. Failure to comply with these measures has a greater impact on the chance of relapse. The role of protein, vitamin D3 and carbohydrate intake has been evaluated as well, which is important for the development of eating habits in post-operative patients. A shortcoming of the study was the subjective assessment of patients' risk factors based on questionnaire data, which should be confirmed in future cohort studies.

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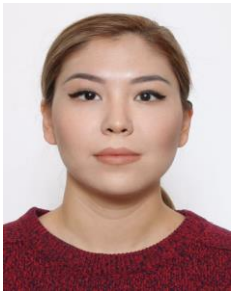

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