



EFFECT OF INTIM-DM MODEL ON SEXUAL DYSFUNCTION IN TYPE 2 DIABETES PATIENTS

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ABSTRACT

Sexual dysfunction is among the most frequently overlooked complications of type 2 diabetes mellitus. Chronic hyperglycaemia produces vascular damage, peripheral neuropathy, hormonal disturbance and psychosocial distress, yet stigma and limited provider competence keep the issue outside routine diabetes care in primary health services. To analyse the effect of the INTIM-DM (Integrated Intimacy Education for Diabetes Mellitus) model, an integrated sexual education model operationalised through the PLISSIT stages, on sexual dysfunction among productive-age patients with type 2 diabetes mellitus. A quasi-experimental study with a one group pretest-posttest design was conducted at Limboto Community Health Centre, Gorontalo Regency, Indonesia, from October to December 2025. Forty-four productive-age patients were recruited through purposive sampling. Sexual function was measured with the International Index of Erectile Function (IIEF) in 8 male respondents and the Female Sexual Function Index-6 (FSFI-6) in 36 female respondents, before and after three small-group education sessions delivered over three weeks. Both are validated Indonesian versions (IIEF-5: item validity $r = 0.70-1.00$, Cronbach's $\alpha = 0.828$, Cohen's $\kappa = 0.879$; FSFI-6: item-total correlation > 0.3 , Cronbach's $\alpha = 0.831$). Data were analysed using the Wilcoxon Signed Ranks Test and the paired t-test in SPSS version 26. At baseline, 37 of 44 respondents (84.1%) showed sexual dysfunction. Among women, the Wilcoxon test produced $Z = -5.061$ with $p = 0.000$; 33 respondents (91.67%) recorded higher FSFI-6 scores, none recorded lower scores and 3 were unchanged. Among men, mean IIEF scores rose from 16.50 ± 6.02 to 19.63 ± 4.63 , a mean difference of 3.125 (95% CI 1.681-4.569), $t = -5.118$, $df = 7$, $p = 0.001$, while the normal category rose from 25.0% to 50.0%. The INTIM-DM model significantly improved sexual function in both male and female patients with type 2 diabetes mellitus. Structured sexual education is feasible for nurses in primary care and merits integration into chronic disease management programmes.

Keywords: diabetes mellitus; nursing intervention; PLISSIT; primary care; sexual dysfunction; sexual health education

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INTRODUCTION

Diabetes mellitus is a chronic disease characterised by impaired glucose metabolism resulting from insulin deficiency, insulin resistance, or a combination of the two. The World Health Organization (2024) reported that diabetes directly caused approximately 1.6 million deaths worldwide in 2021, and almost 47% of these occurred in people under 70 years of age. The International Diabetes Federation (2024) estimated that around 589 million adults aged 20–79 years were living with diabetes, with the South-East Asia region accounting for approximately 78.3 million cases. Indonesia is the only South-East Asian country among the ten largest contributors globally, with roughly 19.5 million cases.

The burden is equally visible at subnational level. In Gorontalo Province, Gorontalo Regency ranks second in the number of people living with diabetes, and district health office data for 2024 recorded 9,094 patients, with Limboto Subdistrict reporting the highest number at 2,004 patients. Several hundred of these patients fall within the productive age range of 15 to 49 years. This distribution indicates that diabetes is no longer confined to older adults but increasingly affects people who remain socially, economically and reproductively active (Moch Rizal, 2021).

One complication of diabetes that is consistently overlooked is sexual dysfunction. A systematic review and meta-analysis by Gebeyehu et al. (2023) reported a pooled prevalence of sexual dysfunction among patients with diabetes of 65.91% in men and 58.81% in women. These figures indicate that more than half of patients with diabetes are at risk of a condition that affects quality of life, interpersonal relationships, psychological wellbeing and marital satisfaction. The underlying mechanisms are multifactorial, involving diabetic neuropathy, microvascular damage in the genital region, hormonal change and psychological distress (Hadibrata et al., 2023).

Despite this high prevalence, sexual dysfunction in patients with diabetes frequently remains unidentified and untreated. Patients often feel ashamed or regard sexual matters as taboo, while health workers tend to concentrate on glycaemic control and physical complications. Murphy et al. (2024) found that professionals rarely initiate discussion of sexual problems with women who have diabetes, citing lack of confidence, absence of protocols and uncertainty about professional boundaries. Research in Indonesia similarly identifies cultural values and social norms as the principal barrier to communication about sexual health between patients and providers (Manurung & Rahardjo, 2023).

Preliminary observation at Limboto Community Health Centre reinforced this picture. Of ten productive-age patients with diabetes enrolled in the national chronic disease management programme, five reported sexual complaints including reduced desire, pain during intercourse, difficulty reaching orgasm, vaginal dryness and erectile difficulty. None of these patients was aware that their complaints were related to diabetes, and no education programme addressing sexual health as part of diabetes management was available at the facility.

Structured sexual counselling has been shown to improve this situation. The PLISSIT model developed by Annon (1976) provides a tiered structure comprising Permission, Limited Information, Specific Suggestions and Intensive Therapy, allowing non-specialist providers to deliver early intervention while retaining a clear referral pathway. Its effectiveness has been demonstrated among women with type 2 diabetes (Mehrabi et al., 2019), diabetic pregnant women (Youssef Abd-Ella et al., 2019), diabetic women in a quasi-experimental setting (Abdelkhaliek et al., 2024) and in primary care through a cluster-randomised trial (Bijlsma-Rutte et al., 2020).

Nevertheless, studies that develop and test an integrated sexual education model specifically for productive-age patients with type 2 diabetes in Indonesian primary care remain scarce, and few evaluate change in sexual function separately for men and women using sex-specific instruments. The INTIM-DM (Integrated Intimacy Education for Diabetes Mellitus) model was therefore developed to combine diabetes and sexual health education, therapeutic communication, partner involvement, psychosocial support and accessible educational media within a single intervention package, using the PLISSIT stages as its operational framework. This study aimed to analyse the effect of the INTIM-DM model on sexual dysfunction among productive-age patients with type 2 diabetes mellitus.

METHOD

Design and setting

This quantitative study used a quasi-experimental one group pretest-posttest design without a comparison group, chosen to assess change in sexual function scores within the same group before and after delivery of the INTIM-DM intervention. The study was conducted in the catchment area of Limboto Community Health Centre, Gorontalo Regency, Indonesia, from October to December 2025.

Population and sample

The population comprised all productive-age patients with type 2 diabetes mellitus registered at the health centre, particularly participants in the national chronic disease management programme.

Forty-four respondents were recruited through purposive sampling. Inclusion criteria were a confirmed diagnosis of type 2 diabetes mellitus, productive age, married status with a resident partner, and willingness to participate. Exclusion criteria were severe complications preventing participation and failure to complete the full intervention sequence. All recruited respondents completed the baseline measurement, the three intervention sessions and the final measurement, with no attrition.

Intervention

The intervention consisted of three small-group education sessions delivered over three weeks using the INTIM-DM module, which had been validated through expert judgement by specialists in medical-surgical nursing and reproductive health. The first session covered diabetes mellitus, its complications, its impact on sexual health and the importance of discussing sexual concerns, representing the Permission and Limited Information stages. The second session addressed healthy lifestyle, glycaemic control, partner communication and factors influencing sexual function. The third session presented practical strategies for improving sexual function, stress management and maintenance of relationship quality, representing the Specific Suggestions stage, with a defined referral pathway for respondents requiring Intensive Therapy.

Instruments

Sexual function in male respondents was measured using the Indonesian version of the International Index of Erectile Function (IIEF-5). The instrument was rendered into Indonesian through a rigorous language transfer procedure comprising two-way translation by sworn translators and cultural adaptation by a panel of urology experts. Validity testing produced item correlations in the range $r = 0.70-1.00$, internal consistency was good with Cronbach's alpha of 0.828, and inter-rater agreement was almost perfect with Cohen's kappa of 0.879 ($p < 0.001$), establishing the Indonesian IIEF-5 as a valid and reliable measure of erectile dysfunction in men (Laksita et al., 2021).

Sexual function in female respondents was measured using the Indonesian version of the Female Sexual Function Index-6 (FSFI-6), a short form of the 19-item FSFI designed for practical assessment of six core domains: desire, arousal, lubrication, orgasm, satisfaction and pain. The Indonesian version was produced through forward-backward translation followed by face validity assessment and field testing. Item-total correlations exceeded 0.3 and internal consistency reached a Cronbach's alpha of 0.831, confirming that the Indonesian FSFI-6 is valid and reliable for use in the Indonesian population (Sesari et al., 2022). Because both instruments are standard tools whose validity and reliability have been established in the Indonesian population, and because the reported coefficients exceed the conventional criteria of an item-total correlation above 0.3 for validity and a reliability coefficient of at least 0.70 for internal consistency, validity and reliability testing was not repeated in the present study. A demographic questionnaire recorded sex, age, marital status, occupation, education, duration of diabetes, medication type, smoking status and presenting complaint.

Data analysis

Univariate analysis described the frequency distribution of respondent characteristics and sexual function categories. Normality was assessed as a prerequisite test using the Kolmogorov-Smirnov and Shapiro-Wilk tests. FSFI-6 scores were not normally distributed, so bivariate analysis in the female group used the Wilcoxon Signed Ranks Test, while IIEF scores in the male group met the assumption of normality and were analysed using the paired t-test. The significance level was set at 0.05.

RESULT

Normality testing of FSFI-6 scores indicated that the data were not normally distributed at either baseline (Kolmogorov-Smirnov $p = 0.010$; Shapiro-Wilk $p = 0.003$) or follow-up (Kolmogorov-Smirnov $p = 0.000$; Shapiro-Wilk $p = 0.000$). IIEF scores in the male group satisfied the assumption

of normality. Accordingly, the Wilcoxon Signed Ranks Test was applied to the female group and the paired t-test to the male group.

Table 1.
Respondent characteristics (n = 44)

Respondent characteristics	f	%
Gender		
Male	8	18.2
Female	36	81.8
Age		
Adult (30-49 years)	44	100
Marital status		
Married	44	100
Occupation		
Civil servant	15	34.1
Private employee	1	2.3
Homemaker	26	59.1
Other	2	4.5
Education		
Primary school	3	6.8
Junior high school	11	25.0
Senior high school	15	34.1
Diploma or bachelor degree	15	34.1
Duration of diabetes		
Less than 5 years	35	79.5
5 years or more	9	20.5
Medication		
None	7	15.9
Oral	32	72.7
Insulin	1	2.3
Oral and insulin	4	9.1
Smoking		
Yes	3	6.8
No	41	93.2
Presenting complaint		
Erectile difficulty	8	18.2
Complaint during sexual activity	36	81.8

Table 1 shows that women and homemakers predominated in the sample, that all respondents were of adult productive age, and that all were married. This profile is relevant to interpretation because the availability of a resident partner is a precondition for the Specific Suggestions stage. The majority had lived with diabetes for less than five years, a phase in which vascular and neuropathic damage is generally not yet advanced, so that psychosocial and behavioural modification retains substantial scope for effect.

Table 2.
Sexual dysfunction at baseline by gender (n = 44)

Category	Male	Female	Total
Normal	4	3	7
Dysfunction	4	33	37

Table 2 indicates that 37 of 44 respondents, or 84.1% of the sample, presented with sexual dysfunction at baseline. The proportion was considerably higher among women than among men. The magnitude of this figure underlines a burden that had previously gone undetected within routine diabetes care at the study site.

Table 3.
Sexual function category in female respondents based on the FSFI-6 (n = 36)

FSFI-6 category	Pretest f (%)	Posttest f (%)
Normal	3 (8.3)	3 (8.3)
Female sexual dysfunction	33 (91.7)	33 (91.7)

Table 4.
Sexual function category in male respondents based on the IIEF (n = 8)

IIEF category	Pretest f (%)	Posttest f (%)
Normal	2 (25.0)	4 (50.0)
Mild	3 (37.5)	2 (25.0)
Mild to moderate	1 (12.5)	1 (12.5)
Moderate	1 (12.5)	1 (12.5)
Severe	1 (12.5)	0 (0)

In the female group the distribution of FSFI-6 categories did not shift between baseline and follow-up. This does not indicate an absence of improvement. As the bivariate analysis shows, FSFI-6 scores rose significantly in almost all respondents, but the magnitude of that rise did not cross the categorical threshold for female sexual dysfunction within a three-week intervention period. Improvement was therefore real at the level of scores while remaining below the level of category change. In the male group, by contrast, categorical movement was evident. The proportion in the normal category doubled and no respondent remained in the severe category after the intervention. This differing pattern is consistent with the understanding that female sexual dysfunction involves a larger number of domains, whereas dysfunction in men is more concentrated in the erectile domain, which responds comparatively quickly to improved knowledge and reduced performance anxiety.

Table 5.
Wilcoxon Signed Ranks Test of FSFI-6 scores in female respondents (n = 36)

Ranks	n	Mean rank	Sum of ranks
Negative ranks	0	0.00	0.00
Positive ranks	33	17.00	561.00
Ties	3	-	-

Note. $Z = -5.061$; $p = 0.000$.

Table 6.
Paired t-test of IIEF scores in male respondents (n = 8)

IIEF measurement	n	Mean	SD
Pretest	8	16.50	6.02
Posttest	8	19.63	4.63

Note. Mean difference 3.125 (95% CI 1.681-4.569); $t = -5.118$; $df = 7$; $p = 0.001$.

Table 5 shows a significant difference between FSFI-6 scores before and after the intervention in the female group. Thirty-three respondents recorded higher scores, none recorded lower scores and three were unchanged. The uniform direction of change across all respondents who moved indicates a consistent response to the intervention.

Table 6 shows that the paired t-test in the male group also produced a significant difference. Mean IIEF scores rose by approximately three points, and the confidence interval for the difference did not include zero, so the direction and magnitude of change can be regarded as stable. The alternative hypothesis was therefore accepted in both groups, indicating an effect of the INTIM-DM model on sexual dysfunction in patients with type 2 diabetes mellitus. It should be noted that the male group comprised only eight respondents, so findings in that group are best read as a preliminary indication.

DISCUSSION

Sexual dysfunction before the intervention

The high proportion of sexual dysfunction at baseline, affecting 84.1% of respondents, is consistent with the meta-analysis by Gebeyehu et al. (2023), which reported a prevalence above half of the diabetic population in both sexes. The predominance of dysfunction among women in the present study also accords with Manurung and Rahardjo (2023), who reported that a large majority of Indonesian women with diabetes experience sexual dysfunction, with higher proportions among those with uncontrolled glucose levels and longer disease duration. Response patterns among female respondents indicated that the desire and lubrication domains were the most affected. Reduced desire is influenced by chronic illness, hormonal change, psychological stress, fatigue and

emotional factors within the partner relationship, while inadequate lubrication produces discomfort that lowers overall sexual satisfaction. Ismail et al. (2021) reported a comparable pattern, with the majority of participants falling in the dysfunction category and recording substantially lower total scores than those without dysfunction. Among male respondents, most cases fell in the mild category. Ponholzer et al. (2005) explained that erectile dysfunction is most frequently encountered at a mild degree because the condition develops gradually and is chronic and degenerative in nature, particularly in the vascular type. More severe degrees generally emerge only when risk factors have persisted over long periods or when cardiovascular comorbidity is present.

Sexual dysfunction after the intervention

After the intervention, the male group showed clear categorical movement, with the normal category rising from 25.0% to 50.0% and the severe category disappearing. The female group showed no categorical movement despite rising scores. This divergence can be understood from the structure of the instruments and the constructs they measure. The FSFI-6 assesses six domains simultaneously, so change in one or two domains may not be sufficient to lift the total score across the threshold, whereas the IIEF is more concentrated on the erectile domain, so improvement is reflected in category change more rapidly. This carries a methodological implication. Evaluation of sexual education interventions in women should not rely on categorical change alone but should also consider continuous score change and domain-level analysis, so that genuine improvement is not misread as absence of effect.

Difference in sexual function before and after the intervention

Both groups showed statistically significant improvement. This can be explained through the mechanism of the PLISSIT stages that form the operational framework of the INTIM-DM model. The Permission stage opens space for patients to discuss matters previously regarded as taboo, the Limited Information stage corrects misconceptions about the relationship between diabetes and sexual function, and the Specific Suggestions stage supplies practical strategies that can be applied directly with a partner. These findings align with the randomised controlled trial of Mehrabi et al. (2019), which reported a significant increase in FSFI scores after PLISSIT counselling among women with type 2 diabetes, and with the quasi-experimental study of Abdelkhaliek et al. (2024), which demonstrated a reduction in the prevalence of sexual dysfunction through improved knowledge, reduced embarrassment and better partner communication. Youssef Abd-Ella et al. (2019) similarly reported significant improvement in the desire, arousal and satisfaction domains following PLISSIT counselling.

Respondent characteristics help to explain the magnitude of response. All respondents were married, so the availability of a resident partner supported the Specific Suggestions stage, which depends on partner involvement, a point also emphasised by Tuncer and Oskay (2023). Most respondents had lived with diabetes for less than five years, a phase in which psychosocial and behavioural modification remains effective. Among homemakers, who formed the largest occupational group, improvement occurred because the intervention reduced anxiety, offered strategies for managing time and demands, and improved communication with partners. Some male respondents nevertheless remained in the moderate category after the intervention. Karimi et al. (2019) noted that at moderate degree, erectile dysfunction is not driven by psychological factors alone but begins to involve vascular and endothelial impairment, so that educational intervention yields partial improvement. This underlines that sexual education should be combined with optimal metabolic control rather than substituted for it.

Implications and limitations

Overall, the study indicates that the INTIM-DM model, operationalised through the PLISSIT stages, can be delivered by nurses in primary care without the qualification of a sexual therapist, provided that a standardised module, training in therapeutic communication and a counselling space that guarantees privacy are available. The practical implication is that sexual health education

merits inclusion as a routine component of chronic disease management programmes, accompanied by periodic screening of sexual function using the FSFI-6 and IIEF and by involvement of partners in education sessions.

Several limitations should be acknowledged. The one group pretest-posttest design without a comparison group means that external influences, such as additional attention from health workers or natural variation in patient condition, could not be fully controlled. The three-week intervention period is short for assessing change in a multidimensional construct. The male group comprised only eight respondents, which limits statistical power in that group. Finally, the sensitivity of the topic leaves open the possibility of social desirability bias, notwithstanding the confidentiality safeguards and enumerator training applied. Further research is recommended using a control group, a larger multicentre sample, follow-up of three to six months, and domain-level analysis of sexual function.

CONCLUSION

Sexual dysfunction was highly prevalent among productive-age patients with type 2 diabetes mellitus at Limboto Community Health Centre before the intervention, affecting 84.1% of respondents, with a considerably higher proportion among women than among men. Following the INTIM-DM intervention, categorical improvement occurred in the male group, where the normal category rose from 25.0% to 50.0%, while improvement in the female group occurred at the level of scores without a corresponding shift in category. A significant difference in sexual function scores before and after the intervention was found in both groups, indicating that the INTIM-DM model has an effect on sexual dysfunction in patients with type 2 diabetes mellitus.

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