Effectiveness of Nurse-Directed Education on Knowledge Regarding Diabetes Mellitus Among Diabetic Patients

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Abstract: Introduction: Diabetes mellitus stands as one of the primary noncommunicable diseases worldwide and is the most common metabolic disorder. The growing number of people affected by DM underscores its considerable impact on global public health. Nurses are adept at providing care and educational support to individuals with diabetes due to their extended patient interaction compared to other healthcare providers. Moreover, they possess the necessary skills and resources to enact efficient strategies and adhere to optimal practices in managing diabetes.

Objective: The study's objectives were to assess the level of knowledge regarding diabetes mellitus among diabetic patients, assess the effectiveness of nurse-directed education on knowledge regarding diabetes mellitus among diabetic patients, and find out the association between knowledge regarding diabetes mellitus with their selected socio-demographic and clinical variables.

Material and Methods: In this study, a quantitative research approach and a pre-experimental research design (one-group pre-test and post-test design) were utilized to evaluate the effectiveness of nurse-directed education on knowledge about diabetes mellitus among diabetic patients. Nonprobability convenience sampling was employed to select 100 diabetic patients from the medical OPD and medical wards of a tertiary care hospital in Vadodara. A self-structured questionnaire was employed to collect socio-demographic and clinical data, as well as to assess the knowledge of patients about diabetes mellitus. Descriptive and inferential statistics were employed to analyze the data as per the study objectives.

Results: The study results indicated that the mean post-test knowledge score was 21.04 ± 3.86 , indicating a notable increase from the pretest mean knowledge score of 12.37 ± 4.25 , showing an improvement of 8.67. Statistical analysis showed a significant difference (t=16.27, df=99, p=0.001), confirming the effectiveness of nurse-directed education in enhancing knowledge about diabetes mellitus among diabetic patients. Additionally, chi-square analysis revealed no significant association between socio-demographic variables and the pre-test level of knowledge regarding diabetes mellitus among diabetic patients. However significant association was noted between the BMI of diabetic patients with their knowledge categories.

Conclusion: The study concluded that nurse-directed education effectively improved the knowledge level regarding diabetes mellitus among diabetic patients and findings may be generalizable to similar contexts.

Keywords: Nurse directed education, Knowledge, Diabetes mellitus, Diabetic patients

1. Introduction

Diabetes mellitus is a chronic condition related to metabolism, characterized by problems with the action of insulin, its release, or both, resulting in elevated blood glucose levels. It is among the world's leading noncommunicable conditions and the most prevalent metabolic condition. An increasing number of individuals affected by DM makes it a significant global public health issue. ^[1]

Based to the World Health Organisation (WHO), the number of individuals suffering from diabetes has increased significantly globally. From 108 million in 1980, It jumped to 422,000,000 by the year 2014, and it is anticipated to hit 592,000,000 by 2025. In adults, the occurrence of diabetes has almost doubled since 1980, going from (4.7%) to (8.5%). There has also been a notable 70% increase in diabetes-related deaths globally

between 2000 and 2019. Interestingly, this surge is particularly notable in developing countries, where about 77% of people with diabetes reside, primarily in middle- and low-income nations. ^{[2] [3]}

India, being one of seven nations in the IDF SEA area, is significantly afflicted by the health issue. Globally, there are 537 million people affected by diabetes, with 90 million residing in the SEA Region. By 2045, this figure is expected to increase to 151.5,000,000. As of 2021, India has 893.91 million adults, with an 8.3% diabetes prevalence, for a total of 774.19 million cases of diabetes in adults.^[4]

In many instances, diabetes is not the main reason why people end up in the hospital; rather, it is often a secondary concern. As a result, patients are usually looked after by healthcare professionals who specialize in other areas besides diabetes.^[5]

Specialist nurses and nursing teams, alongside other medical specialties, are increasingly playing a crucial role in caring for individuals with diabetes. These registered nurses provide information and assistance to patients as well as employees across various medical areas, offering clinic or phone assistance to help patients leave the hospital or prevent unnecessary admissions. Nurses excel in providing treatment and education because they spend considerably more time caring for patients than other healthcare professionals. Additionally, they are better equipped to implement effective measures and best practices in diabetes management.^[6] [7]

The rising incidence of T2DM, also known as type 2 diabetes, reinforces the need for novel methods of treatment. However, healthcare systems are gradually adopting nurse-led models that prioritize patient-centered care over traditional physician-led models. With appropriate training, nurses can effectively manage diabetes, and recent trends show a shift in responsibilities from physicians to nurses.^[8]

Empowering nurses with more independent responsibilities in diabetes care has been proposed as a feasible approach to enhance the outcomes of diabetic patients.^[9]Initial and continuous nurse-directed education assists individuals in overcoming obstacles and coping with the lasting and changing demands of diabetes care and life changes.^[10]

HYPOTHESES

 H_1 - There will be a significant difference between the pre-test and post-test knowledge scores among diabetic patients after the implementation of nurse-directed education at a 0.05 level of significance.

 H_2 - There will be a significant association of pre-test knowledge scores of diabetic patients with their selected socio-demographic variables at a 0.05 level of significance.

2. Methodology

The study adopted a quantitative research approach and utilized a pre-experimental research design (one group pre-test post-test design). Convenience sampling was employed to gather data from 100 diabetic patients at the medical OPD and medical wards of Parul Sevashram Hospital in Vadodara. Formal consent was obtained from the Medical Superintendent of Parul Sevashram Hospital before data collection, and all participants provided informed consent. Socio-demographic and clinical data, along with pre-tests, were collected using a structured knowledge questionnaire administered by the investigator. Nurses were delivered diabetes-related education on the same day as the pre-test. The investigator conducted the post-test 7 days after the intervention. The tool was validated by 9 expert professionals, and its reliability was assessed through the test-retest method. A self-structured questionnaire consisting of 36 items was utilized. Reliability for knowledge was assessed using Cronbach's coefficient alpha, which yielded r=0.746, indicating that the tool was reliable. Descriptive and inferential statistics were used to analyze the data to find out the significant effect of the intervention and to examine the association as per the study objectives.

3. Results

As per the study objectives, the data were collected in a Microsoft Excel spreadsheet and subsequently analyzed using descriptive and inferential statistics in SPSS. The data were arranged, organized, and presented as follows: **Section I:**

Frequency and percentage distribution of demographic variables of Diabetic patients.

Section II:

Frequency and percentage distribution of clinical variables of Diabetic patients.

Section III:

Pre-test and post-test level of knowledge regarding diabetes mellitus among diabetic patients.

Section IV:

Effectiveness of nurse-directed education on knowledge regarding diabetes mellitus among diabetic patients.

Section V: -

Association of pre-test knowledge regarding diabetes mellitus among diabetic patients with their selected sociodemographic variables.

Section VI: -

Association of pre-test knowledge regarding diabetes mellitus among diabetic patients with their selected clinical variables.

SECTION - I

Sr. No	Demographic Variables	Frequency	Percentage
1	Age in years		Tercentuge
-	a 18-30	4	4
	b $31-40$	7	7
	31-40	27	7
	d = 51.60	27	25
	a $51-00$	25	37
2	Cender	51	51
2	a Male	50	50
	a. Mate	50	50
2	D. Telliale	50	50
3	No formal advantion	2	2
	a. No formal education		20
	D. Primary	30	30
	c. Secondary	4/	4/
	d. High secondary/Diplom	a 18	18
	e. Degree and above	3	3
4	Occupation	17	17
	a. Unemployed	4/	47
	b. Daily labourer	8	8
	c. Private job	19	19
	d. Government job	5	5
	e. Student	3	3
	f. Self-employed	18	18
5	Monthly family income(Rs.)		
	a. < 5000	42	42
	b. 5001-10000	21	21
	c. 10001-20000	23	23
	d. 20001 and above	14	14
6	Religion		
	a. Hindu	92	92
	b. Muslim	8	8
	c. Christian	0	0
7	Marital status		
	a. Married	91	91
	b. Unmarried	3	3
	c. Divorced/ separated	0	0
	d. Widower	6	6
8	Living status		
	a. With spouse and childre	n 89	89
	b. With children	3	3
	c. Live in relationship	0	0
	d. With spouse	4	4
	e. With friend	2	2
	f. With relative	0	0
	g. With parents	2	2

Table 1: Frequency	and Percentag	e Distribution	of Demographic	Variables of	f diabetic p	atients.	n=10	0
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Table 1 depicts the frequency and percentage distribution of demographic variables among diabetic patients. The majority, ie,37%, were aged 61 and above, followed by 27% aged 41-50, 25% aged 51-60, 7% aged 31-40, and 4% aged 18-30. Gender distribution was equal, with 50% male and 50% female patients. In terms of education, 47% had secondary education, 30% had primary education, 18% had higher secondary or diploma, 3% had a degree or above, and 2% had no formal education. Occupationally, 47% were unemployed, 19% were in private jobs, 18% were self-employed, 8% were daily laborers, 5% were in government jobs, and 3% were students. Regarding monthly family income, 42% earned less than Rs 5000, 23% earned Rs 10001-20000, 21% earned Rs 5001-10000, and 14% earned Rs 20001 and above. The majority, 92%, belonged to the Hindu religion, while 8% were Muslim. Marital status indicated that 91% were married, 6% were widowed, and 3% were unmarried. In terms of living status, 89% lived with their spouse and children, 4% with their spouse, 3% with their children, 2% with a friend, and 2% with their parents.

SECTION - II

Sr. No	Clinical Variables	Frequency	Percentage	
		(f)	(%)	
1	Duration of DM			
	a. < 6 months	22	22	
	b. 6 months-2 years	18	18	
	c. 2-5 years	22	22	
	d. > 5 years	38	38	
2	Current RBS value			
	a. Less than 140mg/dl	40	40	
	b. Between 140 mg/dl and 199mg/dl	40	40	
	c. Greater than or equal to 200 mg/dl	20	20	
3	BMI			
	a. Underweight	2	2	
	b. Normal weight	65	65	
	C Pre obesity	28	28	
	d Obesity along I	5	5	
		0	0	
	e. Obesity class II	0	0	
	f. Obesity III			
4	Do you have habit of smoking?			
	a. Yes	0	0	
	b. No	100	100	
5	Do you have habit of alcoholism?			
	a. Yes	0	0	
	b. No	100	100	
6	a) Any emergency related to diabetes			
	a. Yes	21	21	
	b. No	79	79	
	b) If yes			
	a. Hyperglycemia	20	20	
	b. Hypoglycemia	1	1	
7	a) Family history of DM			
	a. Yes	33	33	
	b. No	67	67	
	b) If yes			
	a. Mother	14	14	
	b. Father	11	11	
	c. Brother	5	5	
	d. Sister	3	3	
8	a) Previous knowledge of DM			
	a. Yes	4	4	

Table 2: Frequency and Percentage distribution of clinical variables of diabetic patients. n = 100

	b. No	96	96
	b) If yes, Source of information		
	a. Media	0	0
	b. Books	0	0
	c. Relatives	0	0
	d. Friends	0	0
	e. Health personnel	4	4
9	a) Currently taking any diabatic medication	•	
,	a V_{PS}	70	70
	h No	30	30
	b) If yes which dishetic medication	50	50
	a Metformin		
	h Glycomet	42	42
	c Glimeniride	+2 1	1 1 2
	d Inculin	+ 14	4
	u. IIISUIIII	14	14
10	Comorbid con dition	10	10
10		57	57
	a. Hypertension	5/	5/
	b. Cardiovascular disorder	8	8
	c. Cancer	0	0
	d. Autoimmune disorder	0	0
	e. Others	20	20
	f. No	15	15
11.	a) Any medication for comorbid condition		
	a. Yes		
	b. No	65	65
	b) If yes which medication	35	35
	a. Antihypertensive		
	b. Cardiovascular agent	53	53
	c. Anticancer drug	8	8
	d. Immunosuppressant drug	0	0
	e. Other drugs	0	0
		4	4
12.	How often do you perform physical		
	activities/daily exercise?		
	a. Daily	40	40
	b. $3-4$ times/week	36	36
	C Once in week	8	8
	d Nuclear and the	16	16
12	u. No physical activity		
13.	Do you take rest periods in between activities?		
	a. Never		
	b. Seldom	14	14
	c. Occasional	45	45
	d Sometimes	20	20
		14	14
	e. Always	7	7
14.	Do you use any stress management techniques		
	/relaxation techniques?		
	a. Yes	0	0
	b. No	100	100
15.	a) Type of diet.		
	a. Vegetarian	61	61
	b. Non vegetarian	1	1
	c. Mixed	38	38
	b) If nonvegetarian than what is the frequency		
1	of taking non-vegetarian food.		

	 a. Daily b. 3-4 time per week c. Once in a month d. Rarely 	1 23 15 0	1 23 15 0
16.	What are the common symptoms experiencedby you due to diabetes mellitus?a.Frequent Urinationb.Excessive Thrustc.Excessive sweatingd.Blurred visione.Fatigue	39 20 13 24	39 20 13 24

Table 2 illustrates the frequency and percentage distribution of clinical variables among diabetic patients. Regarding the duration of diabetes mellitus, 38% had diabetes for over 5 years, 22% for less than 6 months, 22% for 2-5 years, and 18% for 6 months to 2 years. In terms of current RBS values, 40% had values below 140mg/dl, 40% between 140-199 mg/dl, and 20% at or above 200 mg/dl. BMI distribution showed 65% in the normal weight range, 28% in the pre-obesity range, 5% classified as obese, and 2% underweight. None of the patients reported smoking or alcohol habits. Concerning emergencies related to diabetes, 79% had no emergencies, while 21% experienced emergencies, primarily hyperglycemia. Family history of diabetes was present in 33%, with 14% from mothers, 11% fathers, 5% brothers, and 3% sisters. Only 4% had previous knowledge of diabetes from health personnel. Seventy percent were currently taking diabetic medication, predominantly Metformin. Hypertension was the most common comorbid condition, present in 57% of patients, with 65% of them taking medications for it. Physical activity was reported by 40%, primarily daily. Regarding diet, 61% were vegetarian, and common symptoms included frequent urination (39%), blurred vision (24%), excessive thirst (20%), excessive sweating (13%), and fatigue (4%).

SECTION - III

Table 3: Comparison of pre-test and post-test levels of knowledge regarding diabetes mellitus among diabetic
patients n=100

Level of knowledge	Pre-Test		Post-Test	
	f	%	f	%
Poor knowledge	59	59	0	0
Average knowledge	41	41	79	79
Good knowledge	0	0	21	21

Table 3 depicts the pre-test and post-test levels of knowledge regarding diabetes mellitus among diabetic patients. Results revealed that in the pretest majority (59%) had poor knowledge and (41%) had average knowledge whereas in post-test majority (79%) had average knowledge and (21%) had good knowledge regarding diabetes mellitus among diabetic patients.

SECTION - IV

Table 4 : Comparison between mean, SD, mean D and t value of pretest and post-test of diabetic patients

n=100							
Knowledge	Mean	SD	Range	Mean D	t value	df	p value
Pre-test	12.37	4.25	4-19	8.67	17.27	99	0.001*
Post-test	21.04	3.86	15-33				

Table 4 presents the effectiveness of nurse-directed education on knowledge regarding diabetes mellitus among diabetic patients, assessed using a paired t-test. The mean post-test knowledge score (21.04 ± 3.86) was significantly higher than the pretest mean score (12.37 ± 4.25) , with a mean difference of 8.67. The obtained t-value (16.27, df=99, p=0.001) indicated statistical significance at the p<0.05 level. Pretest scores ranged from 4

to 19, while post-test scores ranged from 15 to 33. These findings suggest that nurse-directed education effectively improved knowledge regarding diabetes mellitus among diabetic patients.

SECTION – V

Table 5. Association of pre-test knowledge regarding diabetes mellitus among diabetic patients with selected socio-demographic variables. n=100

S. No	Demographic Variables		Pre-test k	Pre-test knowledge		df	p-value	
			Poor	Average	value			
1	Age in	years						
	a.	18-30	3	1	1.951	4	0.745 ^{NS}	
	b.	31-40	5	2				
	с.	41-50	17	10				
	d.	51-60	15	10				
	e.	61 and above	19	18				
2	Gende	r						
	a.	Male	29	21	0.041	1	0.839 ^{NS}	
	b.	Female	30	20				
3	Educa	tional status						
	a.	No formal education	2	0	4.451	4	0.348 ^{NS}	
	b.	Primary	19	11				
	с.	Secondary	25	22				
	d.	High secondary/Diploma	10	8				
	e.	Degree and above	3	0				
4	Occup	ation						
	a.	Unemployed	26	21	5.757	5	0.331 ^{NS}	
	b.	Daily labourer	5	3				
	с.	Private job	13	6				
	d.	Government job	3	2				
	e.	Student	0	3				
	f.	Self employed	12	6				
5	Month	ly family income(Rs.)						
	a.	< 5000	22	20	1.915	3	0.590 ^{NS}	
	b.	5001-10000	13	8				
	с.	10001-20000	16	7				
	d.	20001 and above	8	6				
6	Religio)n						
	a.	Hindu	55	37	0.291	1	0.589 ^{NS}	
	b.	Muslim	4	4				
	с.	Christian						
7	Marita	al status						
	a.	Married	53	38	2.307	2	0.315 ^{NS}	
	b.	Unmarried	3	0				
	с.	Divorced/ separated						
	d.	Widower	3	3				
8	Living	status						
	a.	With spouse and children	53	36	3.452	4	0.485 ^{NS}	
	b.	With children						
	с.	Live in relationship	2	1				
	d.	With spouse	1	3				
	e.	With friend	1	1				
	f.	With relative						
	g.	With parents	2	0				

*p value < 0.05 level of significance NS-Non-Significant

Table 5 depicts the association between pre-test level of knowledge regarding diabetes mellitus among diabetic patients with their selected demographic variables which was tested by using the chi-square test. Results revealed that demographic variables such as age in years, gender, educational status, occupation, monthly family income, religion, marital status, and living status did not find any significant association at p<0.05 level with the pre-test level of knowledge regarding diabetes mellitus among diabetic patients.

SECTION - VI

Table 6. Association of pre-test knowledge regarding diabetes mellitus among diabetic patients with clinical
variables. n=100

S. No	Clinical Variables	Pre-test	knowledge	χ2	χ ² df I value	P- value	
		Poor	Average	value			
1	Duration of DM						
	a. < 6 months	14	8	0.428	3	0.934 ^{NS}	
	c. 6 months-2 years	11	7				
	d. 2-5 years	12	10				
	e. >5 years	22	16				
2	2. Current RBS value						
	a. Less than 140mg/dl	26	14	2.232	2	0.328 ^{NS}	
	b Between $1/0$ mg/dl and	24	16				
	199mg/dl						
	C Greater than or equal to 200	9	11				
	c. Greater than or equal to 200						
2							
5	DIVII o Underweight	2	0	0.608	3	0.021*	
	a. Under weight		0	9.098	3	0.021	
	D. Normal weight	44	21				
	c. Pre obesity	10	18				
	d. Obesity class I	3	2				
	e. Obesity class I						
	f. Obesity III						
4	Do you have habit of smoking?						
	a. Yes			NA	NA	NA	
	b. No						
~		59	41				
5	Do you have habit of alcohol?						
	a. Yes						
	b. No	59	41	NA	NA	NA	
6	Any emergency related to diabetes						
	a. Yes						
	b. No	10	11	1.423	1	0.233	
		49	30				
7	Family history of DM						
	a. Yes	21	12	0.438	1	0.508 ^{NS}	
	b. No	38	29				
8	Previous knowledge of DM						
	a. Yes	2	2	0.140	1	0.709 ^{NS}	
	b. No	57	39				
9	Currently taking any diabetic						
	medication?						
	a. Yes	30	31	1.041	1	0.308 ^{NS}	
	b. No	20	10				
10	Comorbid condition						
	a. Hypertension	35	22	1.128	3	0.770 ^{NS}	
	b. Cardiovascular disorder	5	3				

	a Canaar					
	c. Calleel					
	a. Auto inimune disorder	12	0			
	e. Others	12	8			
	I. NO	/	8	-		
11	Any medication for Comorbid					
	condition.	•				
	a. Yes	39	26	0.077	1	0.782^{NS}
	b. No	20	15			
12	How often do you perform physical					
	activition/daily avanaiga?			 		1 1
	a. *p value < 0.05 level of s	significar	nce NS-N	on-Sigi	nificant	
	b. 3–4 times/week	23	17	0.940	3	0.816
	c. Once in week	21	15			
	d. No physical activity	6	2			
		9	7			
13	Do you take rest periods in					
	between activities?					
	a. Never	9	5	10.02	4	0.075 ^{NS}
	b. Seldom	23	22			
	c. Occasional	17	3			
	d. Sometimes	6	8			
	e. Always	4	3			
14	D Do you use any Stress					
	management techniques					
	/relaxation techniques?					
	a. Yes					
	b. No	59	41	NA	NA	NA
15	Type of diet.					
	a. Vegetarian	39	22	2.581	2	0.275 ^{NS}
	b. Non vegetarian	1	0			
	c. Mixed	19	19			
16	What are the common		-			
	symptoms experienced by you due					
	to diabetes mellitus?					
	a. Frequent Urination	17	22			
	b Excessive Thrust	14	6	7 4 2 6	4	0.115 ^{NS}
	c Excessive sweating	10	3	/.120		0.110
	d Blurred vision	13	10			
	e Eatique	13	0			
	c. Faugue	+	U	1		

Table 6 depicts the association between the pre-test level of knowledge regarding diabetes mellitus among diabetic patients with their clinical variables which was tested by using the chi-square test. Results revealed that BMI had significant association at p<0.05 with the pre-test level of knowledge regarding diabetes mellitus among diabetic patients but other clinical variables were non-significant.

4. Discussion

The present study results indicated that the mean post-test knowledge score was 21.04 ± 3.86 , indicating a notable increase from the pretest mean knowledge score of 12.37 ± 4.25 , showing an improvement of 8.67. Statistical analysis showed a significant difference (t=16.27, df=99, p=0.001), confirming the effectiveness of nurse-directed education in enhancing knowledge about diabetes mellitus among diabetic patients. A similar study was conducted by Veeresh VG, an experimental pretest-post-test study on diabetes patients in Karnataka, India, aiming to enhance awareness of quality of life. Data from a random sample of 100 participants were collected using a questionnaire. Pretest and post-test knowledge scores were 12.32 ± 3.28 and 24.67 ± 0.98 , respectively. The resulting t-value was 35.14 with 99 degrees of freedom, significant at p=0.05. The study showed inadequate knowledge among diabetes patients regarding improving their quality of life, but the education program effectively improved comprehension. ^[11]

A study with similar objectives was undertaken by Sumathi Chinnasamy Subramanian and Akila P conducted research at Sri Ramachandra Hospital in Chennai on Type 2 diabetes patients. The experimental group received a 30-minute nurse-led intervention, including video-assisted education on disease management topics like food, medicine, and exercise. Controls received standard treatment. Post-tests on the 15th day showed significant improvements in self-management, self-efficacy, fasting blood sugar (FBS), and postprandial blood sugar (PPBS) levels in the experimental group. The study suggests nurse-led intervention with video-assisted education enhances self-management, self-efficacy, and blood glucose control in Type 2 diabetes patients, ^[12] In the current study, the chi-square analysis revealed no significant association between socio-demographic variables and the pre-test level of knowledge regarding diabetes mellitus among diabetic patients. However significant association was noted between the BMI of diabetic patients with their knowledge categories. In a similar context, Wael Ahmed Al Arawi, and Udai Salamh Al Shaman et al. conducted a cross-sectional study in Saudi Arabia on Type 2 diabetes patients. They used a validated questionnaire in Arabic and English. Among 100 patients, results showed moderate knowledge of diabetes and self-care practices, with good knowledge of complications. No significant associations were found between demographics and knowledge, but males exhibited better knowledge, while females showed better self-care practices. Educational status significantly influences patients' knowledge^[13]

5. Conclusion

The study findings revealed that Nurse-directed education significantly enhanced the knowledge of diabetic patients regarding diabetes mellitus. Hence the researchers recommend that nurses employ similar educational strategies to improve the knowledge of diabetic patients, thereby contributing to better adherence with treatment regimens and reducing the incidence of diabetic-related complications.

Disclaimer

Consent and Ethical Approval

Approval from the institutional research and ethical committee (PUIECHR/PIMSR/00/081734/6102) was obtained, along with specific informed consent from the patients, before conducting the study.

Conflict of Interests

The authors have affirmed that they have no competing interests to declare.

Authors Contribution:

Author 1- Collection and analysis of data, as well as interpretation of results.

Author 2- Approval and finalization of the study's conception and design, as well as manuscript drafting. **FUNDING**

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