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Diabetes Self-Management Knowledge among Type 2 Diabetes Patients at Jaramogi Oginga Odinga Teaching and Referral Hospital, Kisumu County, Kenya

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Abstract: *Objective. The objective of the study was to assess the determinants of foot related complications among diabetic patients at Jaramogi Oginga Odinga Teaching and referral hospital. Design. The study was a descriptive cross-sectional studySetting. The study was conducted at Jaramogi Oginga Odinga Teaching and referral Hospital (JOOTRH), located in Kisumu County Sample. The study utilized simple random method. The study therefore proposed to use 100 patients. The sample was picked through random simple method. The type 2 diabetic patients who came to the diabetic clinic and met the inclusion and exclusion criteria was picked (n = 81) Analysis. Data wasanalyzed through descriptive statistics, Chi square test of independence and logistic regression. Main outcome measures. Diabetes self-management knowledge and demographic characteristics Results.The respondents were asked to indicate their background characteristics based on the age group, gender, marital status and the level of education. Findings established that 78% of the respondents were aged 41 years and above with a mean age of 43 years indicating that type two diabetes is more prevalent in relatively older people. The study further established that male patients were more than their female counter parts at 64%.Knowledge of diabetes self-management is influenced by age, gender, marital status and level of education. The younger and more educated the respondent, the higher the probability of being knowledgeable on diabetes self-management. Male respondents and those that were married were also more likely to be knowledgeable.The number of years a patient had lived with diabetes significantly influenced their knowledge on self-management. The less the number of years a patient had diabetes the more likely they were to be knowledgeable on self-management. Respondents who had had diabetes for eight years or less were three times more likely to be knowledgeable on diabetes self-management compared to those who had had diabetes for more than eight years. Blood glucose monitoring is a key self-care practice that can assist detect acute diabetes complications and delay long term complications such as foot complications amongst diabetes patients. Testing of blood glucose as a self-management practice did not significantly influence their diabetes self-management knowledge.Conclusion. The study therefore concludes that patients at Jaramogi Oginga Odinga Teaching and Referral hospital are knowledgeable on diabetes self-management and that knowledge of diabetes self-care is dependent on knowledge of diabetes, however more efforts are needed to realize 100% of the patients being knowledgeable as opposed to the current 60.5%. Recommendations.The study also recommends that the government of Kenya through Ministry of Health should ensure adequate capacity building and training of diabetes specialists. The researcher recommends that further studies on diabetes self-management knowledge could be done in other counties in Kenya in order to generalize the results.*

Keywords: *Knowledge, Type 2 diabetes, NCDs, complications, Kisumu county, JOOTRH, Kenya, Patients.*

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I. Background

Non-communicable diseases (NCDs) are the leading cause of death globally and diabetes mellitus is the 4th main contributor (Global status report on non-communicable diseases, 2010). In 2013 the global burden of diabetes was estimated to be 382 million people. The International Diabetes Federation (IDF) estimates that this figure is likely to rise to 592 million by the year 2035 (IDF Atlas, 2013). This rise in diabetes is associated with demographic and social changes such as globalization, urbanization, aging population and adoption of unhealthy lifestyles such as consumption of unhealthy diets and physical inactivity.In Kenya, diabetes mellitus prevalence has been on increase and is currently classified among the leading non-communicable diseases of public concern. The Ministry of Health [MOH] notes a diabetes prevalence of 10% of the population. Epidemiological surveys conducted by the Nairobi-based Diabetic Management and Information Center [DMI] gave the estimated prevalence of diabetes mellitus in Kenya above 6% in 2007. In some rural parts of the country such as Nyeri in Central Kenya and Kilifi in the Coast province the prevalence is as high as 11.6% and

above 20% among the richer families in the major urban centers (Chege, 2007). This figure is based on regional projections and is likely to be an underestimation as over 60% of people diagnosed to have diabetes in Kenya usually present to the health care facility with seemingly unrelated complaints.

Self-management of diabetes places the patient at the center of the care and empowers them to make daily decisions about their disease to improve health outcomes (Baghbanian, & Tol, 2012). Self-management also requires the patient to adopt lifestyle changes, balance their resources, values and preferences with a preventive regimen complete with eating healthy, regular physical activity, self-monitoring of blood glucose and medication adherence. Self-management of Type 2 diabetes is linked to self-care concept, which includes activities that individuals initiate and engage in voluntarily to maintain life, health and wellbeing. Poorly controlled diabetes is closely linked with poor self-management that has increased diabetes related complications and treatment cost (Venkatesh, Weatherspoon, Kaplowitz, & Song, 2013). This study conquers that self-management is key to better control of diabetes however the current study would like to examine self-management knowledge and not the practices. Individuals affected with diabetes are often without adequate knowledge about the nature of their disease, its risks factors and associated complications and that this limitation of awareness maybe an underlying factor affecting their self-management (Abdo & Mohamed, 2010). Xu, Pan, and Liu (2010) concluded in their study that individuals with less education were less likely to engage in diabetes self-management. Additionally, the study revealed that individuals with longer period of diabetes and insulin treatment were more actively engaged in blood glucose self-monitoring than those with a shorter period and using oral hypoglycemia medication.

Patient education is now a well-accepted and essential part of practice for all health professionals, it is a cornerstone of diabetes self-management, and it is central to achieving improved outcomes of care, (Redman., 2007).Redman, 2007, refers to education as "practice and movement," i.e., the practice of education is based on a set of theories, research findings, skills learned and practiced, and movement, whereby the education of patients and teachers is constantly evolving. Some health educators consider diabetes education, in its current state as demonstrated in the Diabetes Control and Complications Trial, to be the most fully developed patient education program in any health field.

Calabretta (2012), described a shift in provider roles from the traditional medical model to more patient-centered education goals and clinical management. This shift is particularly evident in diabetes education, in which the person with diabetes, rather than the health care team, provides the majority of diabetes care. The teacher is now a team of teachers: medical and lay professionals who facilitate or lead a learning process. Patients are referred to as "people with diabetes," "learners," or "students." The learning process also includes others affected by diabetes, such as family members, friends, and others in the social support network. Classes are styled as "sessions," "groups," or "gatherings." For most people diagnosed with Type 2 diabetes their condition is life-long and while new types of medication and medical devices are constantly being produced, the basic foundation for good diabetes care still focuses on healthy eating and physical activity, monitoring blood glucose levels and taking medication. The management of Type 2 diabetes involves behavioral change best achieved through integrated care and education.

Diabetes is a complex chronic disease that requires active patient participation to manage their condition on a daily basis, which necessitates education (Kemper, Savage, Niedebaumer, & Anthony, 2005). Diabetes self-management education can lead to empowerment of diabetic patients (Aghili et al., 2013). It has been identified as "the gold standard" for diabetes management and has proven to be an integral component in the care of diabetes as well as being economically effective in the prevention of diabetes related complications (Hill & Clark, 2008; Kemper et al., 2005). The goals of self-management education are to improve metabolic control, prevent acute and chronic complications, enhance quality of life, and maintain cost effectiveness (Funnell et al., 2013).Studies have shown that there is little public knowledge about diabetes. As an example, Maina et al., (2010) in four provinces in Kenya found that only 29% of participants in the research were well aware about diabetes symptoms and its complications. Ulvi et al., (2009) in Pakistan showed that rural communities were unaware of risk factors and complications of diabetes; in addition, the common reason of being aware of diabetes was that a family member of them had diabetes.

Successful self-management is often a challenge for older individuals especially in the presence of mild cognitive impairment and a longer duration of diabetes. Individuals with good memory are able to maintain vigilance in foot checking and blood glucose monitoring (Tomlin & Asimakopoulou, 2014). Studies that reported the use of self-management education in developed countries have deduced the positive impact this intervention has on the prevention of complications (Ezenwaka, & Eckel, 2011).The National Standards for Diabetes Self-Management Education have led the way towards providing quality education. These standards encourage more creative educational options that can be implemented in diverse settings and will improve health care outcomes. The National Standards define 10 content areas: diabetes disease process, nutritional management, physical activity, medications, monitoring, acute complications, risk reduction, goal setting, psychosocial adjustment, and preconception care/pregnancy, (Mensing et al., 2013).

Previous studies have suggested that individuals with diabetes may not follow recommended guidelines for diet and exercise management (Wens et al., 2005). Some studies have found that poor diabetes self-management among diabetes patients led to long-term diabetic complications (Shansi et al., 2011). The purpose of the current study was to assess diabetes self-management knowledge, among patients with type 2 diabetes.The study findings will be of great significance to a number of parties including health service providers, policy designers, Kenyan national Government and Government of County, diabetic patients, and future scholars interested in diabetes education and self-management.

II. Methods

The study was conducted in Kisumu county and ethics approval was obtained from Masinde Muliro University of Science and Technology ethics boardand a research permit from the National Council for Science and Technology.On recruitment, the respondents were informed about the objectives of the study and were assured confidentiality. They were informed that they were free to withdraw from the study at any time without any repercussions and verbal and signed informed consent sought. No further approval was needed since the project didnot require access to patients or personal data.

Research Design

Research design refers to the plan and structure of investigating so conceived as to obtain answers to research question. Creswell (2009) and Cooper and Schindler (2007), define a descriptive survey as a design concerned with finding out the what, where and how of a phenomenon. The study designs adopted for this study was descriptive cross-sectional because they employ quantitative approaches, where self-administered questionnaires were used for data collection. Polit & Hungler (2010) observed that a descriptive research design was used when data was collected to describe persons, organizations, settings or phenomena. The purpose of the design was to gather data at a particular point in time with the intention of describing the nature of the existing conditions (Burns and Grove, 2011).Therefore, the descriptive survey was deemed the best strategy to fulfill the objectives of this study.

Study setting

The study was conducted at Jaramogi Oginga Odinga Teaching and refferal Hospital (JOOTRH), located in Kisumu County. Kisumu County is one of the 47 Counties in Kenya. It lies within longitudes 33° 20'E and 35° 20'E and latitudes 0° 20'South and 0° 50'South. The County is bordered by Homa Bay County to the South, Nandi County to the North East, Kericho County to the East, Vihiga County to the North West and Siaya County to the West. The County covers a total land area of 2,009.5 km2 and another 567 km2 covered by water. The population of the county according to the 2009 Population and Housing Census was estimated at 968,909 persons with 474,687 males and 494,222 females. The County consists of seven constituencies namely: Kisumu East, Kisumu West, Kisumu Central, Seme, Nyando, Muhoroni and Nyakach. There is a total of 35 wards in the county. JOOTRH was preferred as the study site because it is the Major Referral Hospital in Nyanza, Western & North Rift Kenya, serving a population in excess of 5million; average annual outpatient visits are 197,200 and inpatient admissions of about 21,000. JOOTRH serves this population as the regional referral hospital.

Participants

Mugenda and Mugenda (2008) defined population as all elements (individuals, objects and events) that meet the sample criteria for inclusion in a study.The target population was type two diabetic patients at JOOTRH. According to the hospital's permanent diabetes register, the hospital sees an average of 220 patients per month. Out of this number, the hospital sees an average of 120 type 2 diabetics per month.The study utilized simple random method. The study therefore proposed to use 100 patients. The sample was picked through random simple method. The first type 2 diabetic patient who came to the diabetic clinic and met the inclusion and exclusion criteria was picked as respondent number one. Every other alternate patient that also met the criteria was included in the study for example the first client that met these criteria was respondent number one, the third client was respondent number two, the fifth client was respondent number three and so on. Patients that had already participated in the study were not included in case they were met in subsequent visits to the clinic during the study period. Type 2 diabetes patients in the medical and surgical wards who met the inclusion and exclusion criteria also participated in the study. They were selected randomly through balloting.

Questionnaire

The data was obtained using structured and interviewer administered questionnaires. The questionnaire was in three parts i.e. socio-demographic factors, clinical information and a 28-item questionnaire consisting of 5-point response scale (strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2, and strongly

disagree = 1) modified from Michigan Diabetes Research Centre according to whom the alpha coefficient for the twenty-eight items was .76, suggesting that the items have relatively high internal consistency. Scale scores were computed by summing the scores for the individual items constituting the scale. Each item on the scale had a maximum score of one and a minimum of zero. If respondent knew the answer either by strongly agreeing or agreeing or by strongly disagreeing or disagreeing, they would get a score of one. If the respondent said that they did not know or answered wrongly then they would score a zero.

III. Data Analysis

Data analysis was done using the statistical program for social sciences (SPSS) version 25. Inferential and descriptive statistics were used to analyze data. The completed questionnaires were checked for errors and completeness and entered into Microsoft 2010 Excel and subsequently analyzed with version 20 of Statistical Package for the Social Sciences (SPSS Inc. Chicago). Raw data collected was analyzed by assigning numerical values to each response and entered into a coding table. Thereafter the numerical numbers representing responses from the questionnaires were transferred to a code sheet so as to obtain quantitative results from the closed ended questionnaires. Categorical variables were compared using chi-square tests. A multiple logistic regression model was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) between diabetes self-management knowledge and the foot complications of type 2 diabetes, adjusting for potential confounders.

IV. Results

Questionnaires were administered to the respondents present both at the diabetes clinic and at the wards. Out of the 100 questionnaires administered to the respondents, a total of 81 fully responded to the questionnaire giving a response rate of 81%.The response rate was sufficient and representative and conforms to Mugenda & Mugenda (2003) stipulating that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and above is excellent.The respondents were asked to indicate their background characteristics based on the age group, gender, marital status and the level of education. Findings in Table 1 revealed that, established that 78% of the respondents were aged 41 years and above with a mean age of 43 years indicating that type two diabetes is more prevalent in relatively older people. The study further established that male patients were more than their female counter parts at 64%, majority of the respondents were married (77%) and most of the patients had secondary level of education and above with a percentage of 64%.The summary of their responses is given in Table 1.

Table 1: Background characteristics of respondents

Demographics		**Frequency**	**Percent**
Gender	Male	52	64.0%
	Female	29	36.0%
	Total	**81**	**100.0**
Marital Status	Single	8	10.0%
	Married	62	77.0%
	Separated	3	4.0%
	Widowed	7	9.0%
	Total	**81**	**100.0**
Education level	No formal education	2	3.0%
	Primary	27	33.0%
	Secondary	32	40.0%
	College	14	17.0%
	University	6	7.0%
	Total	**81**	**100.0**
Age Bracket	21-30 years	2	2.0%
	31-40 years	16	19.6%
	41-50 years	22	27.0%
	51-60 years	20	25.0%
	65 years & above	21	26.0%
	Total	**81**	**100.0**

Knowledge and demographic Characteristics

The study sought to examine the factors that influence diabetes self-management knowledge and looked at demographic characteristics, clinical information, patient management practices and resources available to aid in acquisition of diabetes self-management knowledge. The knowledge level was assessed using the diabetes knowledge test and depending on the score, patients were categorized as either being knowledgeable or not knowledgeable.P value, Odds Ratio (OR) and 95% Confidence Interval (CI) were used to demonstrate association between knowledge and the demographic characteristics. Statistically significant ($p<=0.05$) values are in bold. Knowledge of diabetes self-management is influenced by age, gender, marital

status and level of education. The younger and more educated the respondent, the higher the probability of being knowledgeable on diabetes self-management. Male respondents and those that were married were also more likely to be knowledgeable as shown in Table 2.

Table 2: Diabetes self-management knowledge and demographic characteristics

Demographic Variables		Knowledgeable			
		Yes	No	OR	
Variable	Characteristic	n (%)	n (%)	(95% CI)	P Value
Age (Years)	Below 50	29(72)	11 (28)	0.361 (0.14-0.91)	**0.029**
	50 and above	20(49)	21(51)		
Gender	Male	36(69)	16(31)	0.361 (0.14-0.92)	**0.031**
	Female	13(45)	16(55)		
Marital status	Not Married	6(32)	13(68)	4.904 (1.62-14.9)	**0.003**
	Married	43(69)	19(31)		
Level of education	Primary and Below	8(28)	21(72)	9.784 (3.42-28)	**0.000**
	Secondary and Above	41(79)	11(21)		

Clinical information and Knowledge on diabetes self-management

The number of years a patient had lived with diabetes significantly influenced their knowledge on self-management. The less the number of years a patient had diabetes the more likely they were to be knowledgeable on self-management. Respondents who had had diabetes for eight years or less were three times more likely to be knowledgeable on diabetes self-management compared to those who had had diabetes for more than eight years. The study further looked at the type of treatment the respondent was on whether oral medication, injectables or lifestyle modification and established that the type of treatment the respondent was on did not significantly influence knowledge on self-management. Family history of diabetes also did not significantly influence knowledge on self-management as demonstrated in Table 3.

Table 4.1 :Clinical information and diabetes self-management knowledge

Characteristic		Knowledgeable			
Variable	Categories	Yes n (%)	No n (%)	OR (95% CI)	P value
Years with Disease	8 years and above	14 (44)	18(56)	3.21 (1.26 - 8.18)	**0.013**
	Below 8 Years	35(71)	14 (29)		
On Diabetic Drugs	Yes	38 (61)	24(39)	1.15 (0.41-3.27)	0.79
	No	11 (58)	8 (42)		
Family history of DM	Yes	31 (61)	20 (39)	1.03 (0.41-2.6)	0.94
	No	18 (60)	12 (40)		

Knowledge and Self-Management Practices in DM patients

The study sought to establish if respondents' self-care practices influenced self-management knowledge. Blood glucose monitoring is a key self-care practice that can assist detect acute diabetes complications and delay long term complications such as foot complications amongst diabetes patients. Testing of blood glucose as a self-management practice did not significantly influence their diabetes self-management knowledge as demonstrated in Table 4.

Table 4: Testing blood glucose and diabetes self-management knowledge

Test blood glucose		Knowledgeable			
	Categories	Yes n (%)	No n (%)	OR (95% CI)	P value
Before breakfast	Yes	33(67)	16(33)	6.19 (2.28-16.79)	0.941
	No	8(25)	24 (75)		
After meals	Yes	27 (55)	22(45)	6.63 (2.19-20.07)	0.943
	No	5(16)	27 (84)		
Only at the clinic	Yes	9 (18)	40 (81)	0.10 (0.04-0.29)	0.062
	No	22 (69)	10 (31)		

Daily foot care and use of special foot wear as self-care practices also did not seem to significantly influence a respondent knowledge of self-management as shown in Table 4.

Knowledge and Availability of Resources for DM self-Management

The study viewed resources as source of information on diabetes self-management and diabetes educator. Respondents who said they were aware of diabetes educators at JOOTRH appeared to be knowledgeable than those who said they were not aware of the diabetes educators as shown in Table 5.

Table 5: Diabetes self-management knowledge and resources

Resources for Self-Care Information	Grouping	Knowledgeable on DM Self Care Yes	No	OR (95% CI)	P value
Information Source	Other*	14(87)	2(13)	0.167 (0.04-0.79)	0.114
	Health Worker	35 (54)	30 (46)		
DM Educator Available	Yes	47(87)	7(13)	8.39 (1.62-43.4)	<0.001
	No	2(7)	25(93)		

* Media, Family, Friend.

Table 6: Logistic regression analysis of predictors of diabetes self-management knowledge

Predictor variable	B	wald	sig	Exp(B)	95% CI For Exp(B) lower	Upper
Age	-.156	.056	.81	0.86	0.24	3.107
Sex	-2.22	8.81	0.003	0.11	0.25	0.47
Marital status	.291	.115	.74	1.34	.25	7.20
Level of education	3.397	16.0	.000	29.88	5.66	157.8
Diabetic educator	4.07		.001	.017	.002	.174

A logistic regression analysis was conducted to predict diabetes self-management knowledge using age, sex, level of education and availability of diabetic educators as predictors. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between those that were knowledgeable on diabetes self-management and those that were not (chi square = 45.598, $p < .001$ with df = 5). Nagelkerke's R square of .583 indicated a moderately strong relationship between prediction and grouping. Prediction success overall was 84.05% (83.7% correctly classified as knowledgeable and 84.4% correctly classified as not knowledgeable). The Wald criterion demonstrated that sex (p=0.003), level of education ('p<.001') and availability of diabetic educator (p=0.001 significantly contribution to prediction. Marital status and age were not significant predictors. Exp(B) value indicates that when level of education is raised by one unit (secondary level of education and above) the odds ratio is 29 times as large and therefore respondents with secondary level of education and above are 29 more times likely to be knowledgeable on diabetes self-management. Male respondents were twice as likely to be more knowledgeable compared to their female counter parts. Respondents who were aware of the availability of diabetic educators also appeared to be more knowledgeable compared to those who said that they were not aware of any diabetic educators at JOOTRH.

V. Discussion

The purpose of the current study was to assess diabetes self-management knowledge, among patients with type 2 diabetes.The results of this research found that the studied population was knowledgeable with 60.5% of respondents scoring above average on the diabetes knowledge test. This level of knowledge might be attributed to inherent patients' characteristics such as being younger, educated, and having stayed more than eight years with diabetes, factors which were significantly associated to knowledge of self-care. Age (OR: 0.4; 95% CI 0.14-0.91, P value=0.029) patients below 50 years were likely to be more knowledgeable, gender (OR: 0.4; 95% CI 0.14-0.92, P value=0.031) males appeared more knowledgeable than females, marital status (OR: 4.9; 95% CI 1.62-14.9, P value=0.003) married persons were most knowledgeable. Patients with secondary education and above (OR: 9.8; 95% CI 3.42-28, P value=0.000) were more knowledgeable, people with diabetes (>8years) were likely to be more knowledgeable (OR: 3.2; 95% CI 1.26-8.18). These findings are consistent with research findings conducted in other parts of the world. Xu, Pan, and Liu (2010) concluded in their study that individuals with less education were less likely to engage in diabetes self-management. A study conducted by Perara, DeSilva, &Perara (2013), concluded that indeed patients who had secondary level education and above were more knowledgeable than their counterparts with primary education and below. The same study

concluded that females were more knowledgeable than their male counterparts and that people who had lived with diabetes for more than 10 years were likely to be more knowledgeable. This difference might have been brought about by the fact that majority of the respondents in the current study were males (64%) and had lived with diabetes for more than five years but less than ten years. Gill, Kumar, and Wiskin (2008) reported that individuals 65 years and less were more knowledgeable than their older counterparts. It was concluded that this was due to the older adults' experience with more diabetes related complications leading to confusion about the signs and symptoms of diabetes. A study by Abdo & Mohamed (2010), revealed significant low levels of knowledge among females (31%), not educated and older age knowledge (78% and 72%).

Sixty-seven percent of respondents stated that they were aware that there are diabetes educators at JOOTRH who had taught them about diabetes self-management. Availability of diabetes educators significantly influenced diabetes self-management knowledge (OR: 8.3; 95% CI 1.62-43.4, P=<0.001). Ninety-three percent of respondents who said that they were not aware whether diabetes educators were available at JOOTRH or not were not knowledgeable on diabetes self-management. Diabetes education is widely accepted to be an integral part of comprehensive diabetes care as it allows patients to assume greater responsibility for their own care. Foma et al., (2013) in a descriptive study "Awareness of diabetes mellitus among diabetic patients in the Gambia: A strong case for health Education and Promotion, found that patient education is the cornerstone of diabetes prevention and management as it accounts for almost 50% in management. The study further shows that diabetes education should be a continuing process with regular visits for reinforcement and not a process to be completed after one or two visits to a healthcare worker or facility. Therefore, with consequent improvements in knowledge, attitudes and skills, diabetes education will lead to better control of the disease. WHO cited, Kenya as one of the 57 countries with a critical shortage of health workers. Whereas acquisition of diabetes self-management requires continuous teaching and evaluation by diabetes educators, this has not been forthcoming at JOOTRH majorly because of the staff shortage.

VI. Conclusion & Recommendation

The study therefore concludes that patients at Jaramogi Oginga Odinga Teaching and Referral hospital are knowledgeable on diabetes self-management and that knowledge of diabetes self-care is dependent on knowledge of diabetes, however more efforts are needed to realize 100% of the patients being knowledgeable as opposed to the current 60.5%.The study recommends diabetic educators should give diabetes management health education every day before patients see clinicians.The study also recommends that the government of Kenya through Ministry of Health should ensure adequate capacity building and training of diabetes specialists.The researcher recommends that further studies on diabetes self-management knowledge could be done in other counties in Kenya in order to generalize the results.

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