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A CROSS-SECTIONAL STUDY ON MALIGNANT TERTIAN MALARIA AMONG CHILDREN BELOW FIVE YEARS ATTENDING THE OUTPATIENT DEPARTMENT LABORATORY AT JINJA REGIONAL REFERRAL HOSPITAL.

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ABSTRACT.

Background:
World Health Organisation estimates that 229 million new cases of Malignant Tertian Malaria in 2019 in the world. 3.3 billion people in tropical regions and Uganda there is still a high mortality rate, especially in children below five years.
Purpose of the study: The study was to determine the prevalence of Malignant Tertian Malaria among children below five years at Jinja Regional Referral Hospital.

Methodology:
A descriptive cross-sectional study was used and data was obtained from 146 respondents using an interviewer-administered questionnaire diagnosed, described, analyzed, and presented information on tables and figures using Microsoft Excel.

Results:
The prevalence of MTM was 48.6% among children below five years. The most common socio-economic factor was household structure with a prevalence of 56.33% and 43.66% for respondents who were staying in completed houses and those whose houses were not in good condition respectively. The knowledge of caretakers about MTM was inadequate most caretakers knew about MTM with a prevalence of 63.38%.

Conclusion:
Although interventions for the management of MTM were in place, a prevalence of 48.6% was still high and demands for additional efforts from the health workers and the Ministry of Health to lower the heavy disease burden.

Recommendation:
The health workers should offer health education about MTM to the patients attending the hospital and emphasis on early diagnosis and treatment of MTM infections should be prioritized.

Keywords: *Malignant Tertian Malaria, OutPatient Department laboratory, Jinja Referral Hospital*
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BACKGROUND OF THE STUDY.

Malignant Tertian Malaria is a protozoan disease caused by *the Plasmodium falciparum parasite.* It is one of the leading causes of mortality and morbidity in many developing countries (WHO, 2017). Victims of the "Malignant Tertian Malaria" form of disease present with non-specific symptoms including malaise, headache, fatigue, fever, chills, and death unless diagnosed and treated promptly and properly.
World Health Organization estimates that there were 229 million new cases of Malignant Tertian Malaria in 2019 in the World .3.3 billion People are at risk of Malignant Tertian Malaria worldwide it's a major problem in tropical regions. Malignant tertian malaria is one of the major diseases of poor people in developing countries. The bulk of the global malignant burden is in Sub-Saharan Africa with the highest global cases and deaths. It is adversely affecting the health of the people as well as the economic development of many developing countries, particularly in Sub-Saharan Africa.
In Sub–Saharan Africa, WHO estimates that more than 85%of malignant tertian malaria cases of children below five years bear the brunt of the disease. In Ethiopia, malignant tertian malaria is one of the major public health and economic concerns. The distribution varies from place to place depending on climate, rainfall patterns, and altitude.75% of the landscape areas below 2000M above sea level are affected by MTM cases. Approximately 68% of the total population in Ethiopia which is above 100 million, is at risk of Malignant Tertian Malaria.
Malignant Tertian malaria is the leading cause of morbidity

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in Uganda with 90-95% of the l population at risk and it's contributing to approximately 13% of under 5 mortalities. Therefore, this study aims to determine the prevalence of Malignant Tertian Malaria among children below 5 years at Jinja Regional Referral Hospital, Jinja district.

Specific Objectives.

- To find out the contributing socio-economic factors to MalignantTertian Malaria among children below five years at Jinja Regional Referral Hospital, Jinja District.
- To find out the caretaker's knowledge about malignant tertian malaria among children below five years at Jinja Regional Referral Hospital, Jinja District.

METHODOLOGY.

Study Design.

A descriptive cross-sectional study was used. This was preferred because it is less time-consuming, allows the collection of data from a large pool of subjects compares differences between groups, and involves statistical techniques like frequencies and percentages.

Study Area.

The study was carried out at Jinja Regional Referral Hospital in Jinja City found in the Busoga sub-region; the hospital is located in the center of Jinja City, not far from the Source of the Nile. The hospital is located approximately 84 kilometers (52 mi) east of Mulago National Referral Hospital. The coordinates of Jinja Regional Referral Hospital are 00°25'52.0″N, 33°12'18.0″E. The economic activities mainly carried out in Busoga areas by Busoga people are Agriculture, especially sugarcane. maize they also carry out fishing, tourism, and others. The study was conducted from June 2023 to November 2023.

Study Population.

The study was conducted among children below five years and their mothers or caretakers who attended services at Jinja Regional Referral Hospital, Jinja District during the study duration, especially in time for data collection.

Sample Size Determination.

The sample size for the study was determined according to the standard formula of Kish and Leslie

$$n = \frac{Z^2pq}{d^2}$$

Where:
N= the sample size required

P= 10.7%=0.107
D= the confidence limit at 95% Cl (0.05)Q= (1-p)
q- (1-0.107) =0.893
Therefore:

$$n = \frac{1.96^2 \times 0.107 \times 0.893}{0.05^2}$$

N=146
Therefore, the sample size included in the study was 146 participants

Sampling Techniques

A simple random technique was used for the study because it was easy to use took little time and was cost effective.
Sampling Procedure

A lottery type of simple random sampling was used to obtain participants where some small papers were written yes and others no. They were put in the box for the willing participants to choose and those who could choose yes were obtained until the required sample size was reached.

Data Collection Methods.

Quantitative data was collected in this study. Data collection was done by use of a questionnaire that was specifically tailored with questions on the Bio data of the client and the socio-economic factors about the client's family. Additional data about the prevalence of Malignant Tertian Malaria was obtained from the preparation of blood films, staining them using field stains A and B examining them for *plasmodium Falciparum* parasite using a microscope. The WHO guidelines for staining and examination of the blood smears and reporting of results were followed.

Data Collection Tools.

The researcher used questionnaires, and hospital documents to conduct this study. More information was obtained from blood smear examination results on Malignant Tertian Malaria diagnosis to collect the data.

Data Collection Procedure.

An introductory letter was picked from the principal's office to get relevant permission from the Facility, the researcher with the research assistant then created a rapport with the supposed respondents and they were

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assured of confidentiality to take part in consenting. Questions were read, interpreted, and translated into the local language (Lusoga) for the respondents to understand what was required of them. Venous blood was then collected from children below five years in purple-topped EDTA Vacutainers and used to make both thick and thin smears. The thick smears were made to detect the presence of the parasite and the thin smears were used to type the required *plasmodium* species to confirm and quantify Malignant Tertian Malaria parasite. The completed questionnaires were retained and only accessed by the researcher.

Study Variables.

Independent variables.

In this study, the independent variables included individual factors, obstetric factors, environmental and health care factors, and individual factors including age, education level, daily expenditure and knowledge of Malignant Tertian Malaria in children below five, and prevention of Malignant Tertian Malaria.

Dependent variables.

This included the prevalence of Malignant Tertian Malaria in children below five years

Quality Control.

Pre-testing of the questionnaire was done weeks before the education of the study where a small population was sampled and allowed to fill it to determine the feasibility, validity, and reliability of the questionnaire and training of the research assistant.
One research assistant fluent in both English and local Lusoga was recruited and adequately trained. Patient demographic data and bio data were counter-checked by asking the patient. The questionnaire was pre-tested and enough ample time was given for data collection.

Inclusion Criteria.

The study was conducted among children under five years who were accented to and their mothers/caretakers who consented to participate in the study and also those who were people present at the time of the study.

Exclusion Criteria.

The children who died during the study, the mothers who went away during the study, and the participants who willingly left.

Data Analysis and Presentations.

Each questionnaire was checked and verified for completeness, missing values, and unclear responses and then manually cleared up on such indications. Data was collected entered into computer program of Microsoft Excel, analyzed, and presented in the form of proportions, figures, and tables.

Ethical Considerations.

Clearance was obtained from the Institute and the hospital allowed me to conduct the study. Informed consent from the respondents was sought both verbally and in writing. Participants were assured of confidentiality and the information obtained from them was used for research only. Participation was fully out of the respondent's choice with the right to pull out at any time when they were no longer comfortable to continue. Whether they participate or not will not interfere with their services anytime from the hospital.

DATA ANALYSIS AND PRESENTATION.

Social Demographic Characteristics of the Participants.

Table 1: shows participants' Socio-demographic data (146).

VARIABLES		FREQUENCY (n=146)	PERCENTAGE(%)
Age of the participants	<1 year	5	3.42
	1_2 years	68	46.57
	3_4 years	62	42.46
	5years	11	7.53
Gender of the participants	Female	77	52.79
	Male	69	47.26

Source of data: Primary data 2023

From Table 1, The total of the participants in the study was 146; out of these 68(46.6%) were between the age group 1-2 years, 62(42.5%) were between 3-4 years, 11(7.5%) were 5 years old and lastly 5(3.42%) were below 1 year.

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77(52.8%) were females and 69(47.26%) were males.

Prevalence of Malignant Tertian Malaria among children below five years at Jinja Regional Referral Hospital, Jinja District.

Table 2: Shows the prevalence of Malignant Tertian Malaria among children below five years.

VARIABLE	FREQUENCY (N)	PERCENTAGE (%)
Children with MTM below 5 years	71	48.6
Children without MTM below 5 years	75	51.4

Source of data: Primary data 2023

From Table 2, Out of 146 participants, 71(48.6%) of the children had MTM and75/146(51.4%) of the children did not have MTM.

Socio-Economic Factors to Malignant Tertian Malaria among Children below FiveYears at Jinja Regional Referral Hospital, Jinja District.

Table 3: Showing the socio-economic factors associated with MTM among children below 5 years.

SOCIAL ECONOMIC	FREQUENCY		TOTAL	PERCENTAGE (%)	
VARIABLE	CHILDREN WITH MTM	CHILDREN WITHOUT MTM		CHILDREN WITH MTM	CHILDREN WITHOUTMTM
Number of people in thehousehold					
1-3	18	32	50	25.35	42.66
4-6	37	23	60	52.11	30.66
>6	16	20	36	22.53	26.66
Maternal education					
Primary	28	32	60	39.4	42.66
Secondary	10	20	30	14.08	26.66
Tertiary and above	3	7	10	4.22	13.33
Illiterate	30	16	46	42.25	61.33
Residence					
Rural	46	28	74	64.73	37.33
Urban	25	47	72	35.21	62.66
Wealth of the parent					
Poor	40	20	60	56	26.6
Average	19	37	56	26.6	49.33
Rich	12	18	30	16.9	24
Household structure					
Completed	40	63	103	56.33	84
Not in good condition	31	12	43	43.66	16
Staying near garbage collection points					
Yes	42	34	76	59.15	45.33
No	29	41	70	40.84	54.66

Source of data: Primary data 2023

From Table 3, 18/50(25.35%), 37/60(52.11%), and 16/36 (22.53%) with family members 1- 3, 4-6, and >6 respectively had MTM people as well as 32(42.6%), 23(30.6%) and 20(26.6%) respectively did not have MTM. Among children born by parents who did not attain any education (illiterate), 30(42.25%) had MTM while 16(61.3%) did not have MTM. 28(39.4%), 10(14.08%), and 3(4.2%) of the children had MTM and their parents had attained primary, secondary, tertiary, and above respectively whereas 32(42.6%), 20(26.6%) and 7(13.3%) had no MTM.

Regarding residence, among rural dwellers, 46(64.73%) had MTM while only 28(37.3%) did not have MTM, and among urban dwellers, 25(35.21%) had MTM and 47(62.6%) did

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not have MTM.

Among the poor parents, 40(56%) had MTM while 20(26.6%) did not have MTM, 19(26.6%) and 12(16.9%) who had MTM belonged to parents with average and rich financial status and 37(49.3%) and 18(24%) did not have MTM. Among the participants who had completed houses, 40(56.3%) children had MTM 63(87%) did not have MTM well as those whose houses were not in good condition 31(43.66%) had MTM and 12(16%) tested did not have MTM.

Of participants who stayed near garbage collection points 42(59.15%) of the children had MTM while 34(45.3%) did not have MTM. 29(40.8%) and 41(45.3%) staying far from garbage collection points tested positive and negative respectively.

Caretaker's Knowledge about Malignant Tertian Malaria among Children below Five Years at Jinja Regional Referral Hospital, Jinja District

Table 4: Shows the knowledge of caretakers about MTM.

VARIABLE	FREQUENCY		TOTAL	PERCENTAGE (%)	
	WITH MTM	WITHOUT MTM		WITH MTM	WITHOUT MTM
Do you know about MTM?					
Yes	45	71	116	63.38	94.66
No	26	4	30	36.61	5.33
Which of these is the cause of MTM?					
Mosquito bite	42	58	100	59.15	77.33
Transfusion	1	2	3	1.4	2.66
Am not sure	28	15	43	39.43	20
Do you know any signs or symptoms of MTM?					
Yes	27	59	111	81.69	70.66
No	44	16	35	18.31	46.66
Yes	27	59	86	38.02	78.66
Do you know any preventivemeasures?					
No	44	16	60	61.97	21.33
If yes, which one of these?					
Use of ITN	20	10	30	28.16	13.33
Using repellants	9	5	14	12.67	6.66
Destroy bleeding site	21	6	27	29.57	8.45
Do you know that it is important to treat MTM early?					
Yes	33	73	106	46.47	97.33
No	38	2	40	53.52	2.66
Do you think it's important for children to sleep under mosquito nets?					
Yes	61	42	117	73.2	86.66
No	10	33	29	26.7	13.33
If yes what are some of the advantages?					
Help to save money	21	9	30	29.57	12
Reduce the burden of MTM on them	34	36	70	47.88	48
Child sleeps better	14	3	17	19.71	4
Yes	47	61	108	66.19	81.33
Have you ever heard of ITNs?					
No	24	14	38	33.8	18.66
If yes, do you, have it?					
Yes	46	34	80	64.78	45.33
No	21	7	28	29.57	9.33
If not why?					
Lost	5	4	9	7.04	5.33
Used for other purpose	17	3	20	23.9	4

Absence of bed	3	0	3	4.22	0

From Table 4, out of 146 participants, 116(79%) knew about MTM, and out of these,45(63.4%) had children with MTM meanwhile, only 71(94.6%) of them had children who were negative for MTM. 100(63.5%) caretakers suggested mosquito bites as one of the causes of MTM, and among these, 42 (59.2%) of their children were positive for MTM, and 58(77.3%) of their children were negative. The caretakers who only knew transfusion as a cause of MTM were very few 3(2.1%) compared to those who were not sure about the cause of MTM with that is to say,43(29.5%). For children whose caretakers knew transfusion was a cause of MTM, only 1 child was positive with a prevalence of 1.4%, and 2 children with a prevalence of 2.6% were negative for MTM meanwhile for caretakers who were not sure of the causes 28 of their children with a prevalence of 39.43% had Malignant Tertian Malaria while only 15 children with a prevalence of 20% had no MTM

111(76%) of the caretakers knew the signs and symptoms of MTM, out of these, 58(81.7%) of their children were positive for MTM, while 53(70.6%) of their children had no MTM. Meanwhile,35 caretakers with a prevalence of 23.9% had no idea concerning signs and symptoms of MTM, and among these,13 of them with a prevalence of 18.3% of their children had MTM, and 22 children with a prevalence of 46.6% were negative.

Out of the 146 caretakers that participated in this study, only 86 caretakers with a prevalence of of58.9% knew preventive measures of MTM, and among these,27(38%) of their children had MTM although they knew the preventive measures, and 59 of them with a prevalence

of 78.6% had children without MTM, 60(41.1%) of the caretakers had known idea about preventing MTM, and 44 of the caretakers with a prevalence of 61.9% their children were positive for MTM while only 16(21%) out of the 60 caretakers their children had no MTM.

Out of the 86(58.9%) caretakers who knew the preventive measures of MTM, 30 of them with a prevalence of 34.8% knew that MTM can be prevented by the use of ITNs and 20 caretakers with a prevalence of 28.16% of children had Malignant Tertian Malaria while only 10 caretakers with the prevalence of MTM 13.33% their children were negative of MTM. 14(16.3%) knew the use of repellents and only 9(12.67%) of their children had MTM,5 caretakers with a prevalence of 6.6% were negative. Meanwhile, 27(31%) knew only destroying breeding sites as a preventive measure and 21 with a prevalence of 29.6% of their children had MTM, 6(8%) caretakers of their children were negative for MTM.15(17.4%) knew the use of insecticide sprays as a preventive measure of MTM and only 8 caretakers with a prevalence of 11% had children that were positive for MTM and 7(9.3%) of their caretakers had children without MTM.

According to the results in the above table, 106 caretakers with a prevalence of 72.6% knew that it is important to treat MTM in the early stages while the remaining 40(27.4%) did not know. Out of these, 33caretakers with a prevalence of 46.5% of their children had MTM while those without MTM 73 with a prevalence of 97.3%, meanwhile, those who did not know that is important to treat MTM early 38 (53.52%)of them had children with MTM and only 2(2.6%)were negative for MTM. 117 (80%) of the caretakers thought it was important for children to sleep under mosquito nets and 29 with a prevalence of 19.8% did not. Among those who thought it was important,52(73.2%) of their children were positive for MTM and 65(86.6%) were negative.19 children out of those who thought it was not important for their children to sleep under a mosquito net with a prevalence of 26.7% had MTM while only 10 children with a prevalence of 13.3% had no MTM. 30 of the caretakers out of 117(80%) caretakers who thought it was important for their children to sleep under mosquito nets suggested saving money as one of the advantages. Among these, 21(29.6%) of their children had MTM while only 9(12%)of their children had no MTM,70 caretakers with a prevalence of 59.8% knew reducing the burden of MTM on them as the advantages for their children to sleep under mosquito nets and 34 children of these caretakers were positive for MTM while36 were negative with a prevalence of 47.8%and 48% respectively.

17(14.5%) suggested that it is advantageous because the child sleeps better and out of those 14 caretakers had children with MTM and only 3 children had no malaria with a prevalence of 19.7%and 4% respectively.

108 caretakers with a prevalence of 73.9% had ever heard of ITNs while 38 with a prevalence of 26.1% had not. Out of 108 (73.9%) caretakers who had heard about ITNs, 47 children of these caretakers with a prevalence of 66.2% were positive while 61 children were negative with a prevalence of 81.3%. Meanwhile among those that had never,24(33.8%) of their children had MTM and only 14(18.6%) of their children were negative. Among the caretakers who knew that ITNsexit,80 of them with a prevalence of 74% had the ITNs in their homes, and only 28 with a prevalence of 25.9% did not have the ITNs. For the caretakers who had the ITNs, only 46 of them had children with MTM while the remaining 34 their children had no MTM with a prevalence of 64.7%and 45% respectively. And those who did not have ITNs 21(29.5%) of their children were positive and 7(9.33%) were negative for MTM.

Out of 32 caretakers who did not have ITNs,9 (28.1%), caretakers explained that the reason why they did not have ITNs was that they got lost, some suggested that they use them for other purposes and the prevalence was 62.5%, while those that have ITNS because they lack beds were 3 with a prevalence of 9.4%. Those whose ITNs were lost,

5(7.04%) of their children had MTM while 4 children with a prevalence of 5.33% were negative for MTM. Meanwhile, of those who were using them for another purpose 17 of their children with a prevalence of 23.9% had MTM, and 3 children with a prevalence of 4% had no MTM. All the children whose caretakers lacked beds had MTM that is to say 3 with a prevalence of 4.22%

DISCUSSIONS.

Prevalence of MTM among children below five years attending OPD laboratory at Jinja Regional Referral Hospital.

According to the study findings of the research, a prevalence of 71(48.6%) Malignant Tertian Malaria was obtained which is lower than the study findings of a similar study at Kiryandongo Refugee Camp which revealed 55.04% (Paul Oboth (2019)). This could be due to the small sample size used, the mothers of participants have tried to put in place the guidelines provided to them during antenatal visits and applying continuous teachings about the dangers of malaria talks and TV shows. Also taking the children early to the hospital for early malaria infection detection for early treatment and making sure that their children sleep under treated mosquito nets.

The study findings showed a higher prevalence of 48.6%. This could be due to the researcher using a small sample size, the mothers practicing environmental sanitation and giving their children prophylaxis for malaria.

The socio-economic factors associated with MTM.

The study findings showed that children from poor families had a higher prevalence of 40(56%). This could be due to the failure of mothers to raise transport to the hospital sometimes for early malaria diagnosis of their children and failure to show up due to inferiority complex while in Rwanda mothers access the hospital due to many government health services available

The study findings showed a higher prevalence of children whose mothers were living in rural areas with 46(64.73%). This could be due to the large sample size used by the researcher; the rural areas are hard to reach mothers end up not being given treated mosquito nets and mothers are far away from malaria-free services provided by the hospital.

The study findings showed a higher prevalence among the children whose mothers were staying near the garbage with 42(59.15%). This could be due to large numbers un removed garbage in Jinja full of bottles with stagnant water that acts as the bleeding sites for mosquitoes that infect children and failure to burn the garbage to kill the life cycle of mosquitoes while in Ethiopia, they have better practices to remove garbage.

The study finding showed a prevalence of 10(14.08%) among children whose mothers had secondary education which is similar to another study findings from Rwanda by (Faustin *et al*.,2020). This could be due to both parties knowing the dangers of malaria infection in children and the control and prevention measures to eliminate mosquitoes.

The knowledge of caretakers about MTM among children below five years.

The findings of the study revealed that 79% of the caretakers knew MTM. This is because of the massive health education about MTM, its prevention, and treatment especially at the health facility which happens in the health talks to them. This is higher than the study conducted in south Ethiopia which indicated that 64.9% of the caretakers knew MTM.

The study findings showed that caretakers who knew mosquito bites as a cause of MTM had a lower prevalence of 63.5% than that of a study done by (Abossie *et al*., 2020) with 71.2%. This is because that is the most common way the caretakers were taught in which MTM can be transmitted.

In addition, the study findings of the researcher indicated that caretakers with a prevalence of 34.8% mentioned ITNs as an MTM preventive measure. This is because ITNs are supplied by the government almost every year and this can also be due to the massive health talks on how to use ITNs. This is contrary to the study by Debash,(2022) indicated that 73.0% mentioned ITNs as a preventive measure.

CONCLUSIONS.

With the findings of the study the researcher compiled, the following conclusions were made; The prevalence of MTM was 48.6% among children below five years attending the Outpatient Department laboratory at Jinja Regional Referral Hospital. The most common socioeconomic factor was household structure with a prevalence of 56.33% and 43.66% for respondents who were staying

in completed houses and those whose houses were not in good condition respectively. The knowledge of caretakers about MTM was adequate where most of the caretakers knew about Malignant Tertian Malaria with a prevalence of 63.38%.

STUDY LIMITATIONS.

The research was limited by the problem of doing research concurrently with other schools' activities and money challenges, some participant's important information was hidden.

RECOMMENDATIONS.

- The government of Uganda through the Ministry of Health should continue with mass sensitization of Malignant Tertian Malaria, spread, prevention, and treatment. Furthermore, to continue with the constant supply of ITNs and follow up if they are supplied to every part of the country, especially in the Jinja district.
- The health workers of the hospital should educate the mothers during their antenatal visits to the hospital and those who come for immunization of their children about the basic knowledge of MTM. This should commence as soon as possible as it could help cut down the increasing prevalence of the disease among children below 5 years
- Early diagnosis of Malignant Tertian Malaria should be made by health workers mainly through testing patients for malaria infection and getting infected ones treated with a minimum delay.

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LIST OF ABBREVIATIONS.

B/S: Blood smear
DHS: Demographic and Health Surveys IPIS: Intestinal parasitic infections
ITNs: Insecticide Treated Mosquito nets MON: Ministry of Health
MTM: Malignant Tertian Malaria
OPD LAB: Out Patient Department Laboratory
PFPR: Plasmodium falciparum prevalence Rate
RDT: Rapid Diagnostic Test
SOP: Standard Operating Procedures
WHO: World Health Organization
JRRH: Jinja Regional Referral Hospital

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CONFLICT OF INTEREST.

The author declares no competing interests.

AUTHOR BIOGRAPHY.

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