Research Article

Predictors of Maternal Near Miss among Women Receiving Care at Wolaita Sodo University Teaching Hospital, Southern Ethiopia: Institution Based Cross Sectional Study

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Abstract

Background: Maternal near miss (MNM) is defined as "woman nearly died but survived a complication that occurred during pregnancy, child birth or within 42 days of terminations of pregnancy".

Objective: To assess the frequency and predictors of maternal near miss among women receiving obstetrical & gynecologic care at Wolaita Sodo University Teaching and Referral Hospital (WSUTRH).

Methods: An institution based cross- sectional study design was employed from 15th April to 15th June 2017. The total sample size was 508 and the Kth interval was used to recruit the study participants. Bivariate and multivariate logistic regression model were used.

Results: The prevalence of MNM is146 out of 508(28.7%). Most MNM conditions are due to unsafe abortions. Traveling long distance ≥ 25KM (AOR=2.36; 95% CI: 1.27-4.39), Single ANC visit(AOR= 2.17; 95%CI: 1.07-4.41), administrative problems (AOR= 3.69; 95% CI:1.14-11.88), Primi/multigravida(AOR=0.48; 95%CI: 0.24-.99), bad obstetric history (AOR= 2.53; 95% CI: 1.22-5.27) and history of previous C/S(AOR= 2.61; 95%CI:1.19-5.74) were significant predictors of maternal near misses.

Conclusions: The frequency of MNM was high in WSUTRH . Preventing maternal delay and improving quality of care at all settings are recommended.

Keywords: Maternal near misses; Danger signs; Wolaita Sodo; Ethiopia

Introduction

Maternal near miss or severe acute maternal morbidity is defined as; a woman approached to die but survived from a complication that happened during pregnancy, child birth or within 42 days of terminations of pregnancy [1,2]. Near miss is more frequent than maternal death and it provides more information on the pathways that lead to severe morbidity or death [3,4].

Delay in seeking to get care by women and her family, delay in reaching to an adequate care facility and receiving adequate treatment are the three delays that contributes for high maternal mortality and morbidity [5]. Most maternal morbidities couldn't be attributed to a single delay; more commonly, a combination of factors leads to the maternal near misses [6].

Studies indicate that access to right health care like skilled birth attendance at each and every service and timely referral to obstetric emergency care can greatly minimize maternal death and disabilities. women in the Sub Saharan Africa suffered by high prevalence of maternal illnesses, near misses and other devastating and acute obstetric complications due to poor access to obstetric services [7].

Globaly, approximately 800 women die every day from preventable causes associated to pregnancy and child birth. In addition, an additional ten million women experience some kinds of complications. The life time risk of maternal death is 1 in 39 women in Sub Saharan Africa but it is 1 maternal death from 3800 women in industrialized countries [8]. Therefore, Maternal deaths are seen as the tip of iceberg for maternal morbidity as for every woman who dies many more will survive, but often develop lifelong disabilities [9].

The magnitude of maternal near misses of in ten Hospitals of Ethiopia varies from institutions to other institutions but overall national burden of maternal near misses was 2568 out of 32541 live births making the national maternal near miss prevalence rate 7.9% but in Southern Nations Nationalities and Peoples Region (SNNPR) 18.3% in 2011 by FIGO LOGIC initiative study report [10].

Near miss is a better indicator of maternal health service quality than death, because it provides information that, elucidates the factors that contribute to a fatal outcome; it is therefore used as a basis for the adoption of measures aimed at improving maternal care [11,12].

The ultimate purpose of the maternal near miss approach is to positively promote quality of care in order to improve clinical practice and reduce preventable life threatening complications and death through the use of best evidence based medical practices [1].

This study was aimed to find out the prevalence of maternal near misses and its predictors through the application of disease specific criteria with limited use of laboratory work ups. It is also aimed to initiate and help policy makers to critically think and bring the best solution by utilizing accurate & relevant information on the existing problem. For example if the Maternal near miss occurs due to severe haemorrhage who is in need of blood transfusion, so that the health policy makers should plan for the availability of blood bank for survival of this mother and its prevention.

Therefore, we were impressed to conduct this research in order to identify the prevalence of maternal near misses and its predictors at Wolaita Sodo University Teaching and Referral Hospital in order to create and provide accurate and relevant information for policy makers and health administrative bodies that helps them to set long term plan on service quality improvement strategies to achieve sustainable developmental goals (SDG) in 2030.

Methods and Materials

An institution based cross- sectional study design was employed at WSUTRH from 15th April to 15th June, 2017.Wolaita Sodo University Teaching and Referral Hospital is found in Sodo Town which is located 330 KM south of the capital Addis Ababa and 165 KM away from Hawassa; the capital city of the Southern Nation Nationalities Peoples regional sate.

Wolaita Sodo University Teaching and Referral hospital was established in 1912. It is the only referral hospital that serving more than 3.5 million populations of Wolaita zone and the other neighboring zones. There were 250 functional beds for admitted patients to get treated under inpatient form.

A total of 508 Systematically Selected women who were pregnant, in labour, or who delivered or aborted and up to 42 days post-partum arriving at WSUTRH for Antenatal follow up or with any of the listed criteria for near miss diagnosis or those who develop any of those conditions after admission to this hospital from 15th April to 15th June, 2017 were involved in this study

All women who were arriving at ANC, labour and delivery, post-partum and abortion unit with both for Antenatal follow up and visiting WSUTRH in seek of medical care due to presence of any single danger signs during the study period were included. But MNM that occurred due to accidental or incidental causes and/or related to other chronic gynecologic problems and those women who were at unconscious state excluded from this study because of the incapability of women to provide the desired information during data collection.

Systematic sampling technique was used in order to allocate study participants randomly. The total numbers of Women visiting this hospital for both ANC follow up and for seeking of medical care in the last six months prior to this study were 4572. This figure again divided for 6 months and accordingly the average client flow for one month is expected to be 762. And again the figure obtained for one month was multiplied by 2 months of data collection period making the numbers of women visiting this hospital were 1524. The Kth value of women visiting this hospital was calculated as:

K= N/n, where N= number of units in the source Population, n= number of units in the Sample, K= Sampling fraction (Sampling Interval)

N= 1524, n= 508, therefore K= 1524/508= 3. Therefore, we have selected the first individual by using lottery method then followed by every 3rd regular intervals of women arrived to this hospital were interviewed and observation was made on their respective charts simultaneously after finishing interview in order to determine Maternal Near Miss Conditions.

The MNM is defined for this specific study as women who developed the life threatening complications based on disease specific criteria for example; women who developing Eclampsia, severe pre-eclampsia, haemorrhage, Unsafe abortion, sepsis, uterine rupture and obstructed labour during pregnancy, child birth and post-partum period including early terminations of pregnancy.

The data were collected through face to face interviews and observation on patient charts was also made by using structured and pre tested questionnaire and check list respectively. One day training was given for both data collectors and supervisors to assure the quality of data. 5% pretest was conducted prior to data collection in order to check the validity of the questionnaire.

Data were entered into Epi-data version 3.1.3 and exported to SPSS version 20 for analysis. Descriptive statistics was conducted. Bivariate and multivariate analysis was generated. In addition multicollinearity was also controlled during data analysis to check all independent variables being independent from each another.

Ethical clearance was obtained from the Research and Ethics Committee of Wolaita Sodo University. Permission letters were also obtained from WSUTRH. All concerned bodies were officially contacted through permission letters. Informed consent from each study participants was obtained and the right to refuse during data collection was respected and confidentiality was assured.

Results

Socio-demographic characteristics of respondents

The total numbers of the study participants were N=508 with 100% response rate. The median age of the study participants is 25 years with the standard deviation of +/- 5.026.

Two hundred seventy (53.1%) of the study participants were housewife followed by 103(20.3%) employee of any organization. 148(29.1%) of the study participants' household monthly income is less than 1000 ETB. More than one third 180(35.4%) of the study participants have completed secondary education followed by primary education (28.1%) (Table 1).

Infrastructure, service utilization and service delivery related predictors

Most 291(57.3%) of the study participants replied that they travel less than 25KM from home to hospital but 217(42.7%) of the study participants travel ≥ 25 KM from their home to hospital. Majority 329(64.8%) of the study participants use ambulance service during emergency. Four hundred eighty three out of 508(95.1%) study participants responded that health center is available in the nearest to their living area.

Majority of the study participants 449(88.4%) were booked for Antenatal Care (ANC) services. Among booked women 194 out of 449(43.2%) received four visits of ANC services.

Table 1: Socio-Demographic Characteristics of the Study Participants' On Maternal Near Misses at WolaitaSodo University Teaching & Referral Hospital, Southern Ethiopia.

S.N	Variables	Frequency, N =508	Percent (%)
1	**Age Groups of Participants**		
	15-19 years	42	8.2
	20-34 years	428	84.3
	35-49 years	38	7.5
2	**Marrital Status**		
	Single	13	2.6
	Married	490	96.5
	Others(widowed & divorced)	5	0.9
3	**Occupation**		
	Housewife	270	53.1
	Employee	103	20.3
	Merchant	86	16.9
	Others(day labourer, farmer & student)	49	9.6
4	**House Hold Income**		
	Less than 1000ETB	148	29.1
	1001-2500ETB	164	32.3
	2501-5000ETB	129	25.4
	Greater than 5000 ETB	67	13.2
5	**Women educ. Status**		
	No formal education	74	14.6
	Primary education	143	28.1
	Secondary education	180	35.4
	Tertiary /college/university	111	21.9
6	**Partner educ. Status**		
	No formal education	65	12.8
	Able to read & write	5	1
	Primary education	101	19.9
	Secondary education	150	29.5
	Tertiary /college/university	187	36.8
8	**Living Place**		
	Rural	199	39.2
	Urban	309	60.8
9	**Decision Maker**		
	Herself or Both husband & wife	346	68.1
	Her husband only or Her-mother -in-law	162	31.9

Less than half 207(46.1%) out of 449 women who received ANC services among study participants were counseled on at least one danger signs of pregnancy (Figure 1). Among women who have got counseling on at least one danger signs, most women frequently counseled on vaginal bleeding (74.4%) followed by severe head ache (56%).

Almost all 503(99%) women didn't face medical personnel related problems such as late and wrong diagnosis, insulting and lack of politeness. Majority 483(95.1%) of the study participants replied that they didn't faced hospital administration related problems such as lack of drugs and supplies, lack of beds, lack of cleanliness of the room and man power.

Four hundred and seventy eight out of 508(94.1%) replied that they had no personal problems such as lack of awareness, lack of money and bad socio-cultural beliefs that delays utilizations of institutional delivery (Table 2).

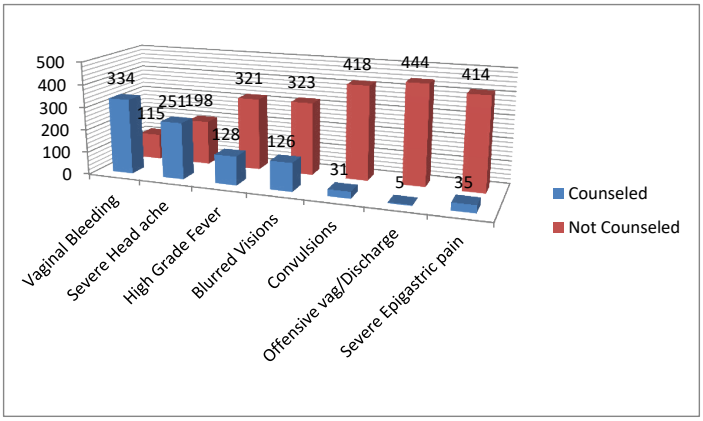

Figure 1: Common Danger signs counseled during ANC visits among service users at WSUTRH, Southern Ethiopia from 15th April to 15th June, 2017.

Table 2: Length of travel and Transportation Related Characteristics of the Study Participants' at WSUTRH, Southern Ethiopia.

Variables	Frequency, n=508	Percent (%)
Distance, N=508		
<25 km	291	57.3
>/=25 km	217	42.7
Ambulance use, N=508		
Yes	329	64.8
No	179	35.2
Other transport used, N=179		
Automobile/private car	23	4.5
Taxi	123	24.2
Public transport	33	6.5

Obstetrical related characteristics of study participants

Most 239(47%) of the study participants were multigravida (2-4 pregnancy) mothers whereas 198(39%) and 71(14%) were primigravida and grand mulitigravida (>/=5 pregnancies respectively. Most 200(64.5%) out of 310 were multiparous and 56(18.1%) and 54(17.4%) were grand multiparous and primipara women respectively. Among 310 women who had history of delivery 78(25.2%) had developed bad obstetric complications once upon their life time (Tables 3 and 4).

Among 310 women who had history of delivery, 79(25.5%) had history of Cesarean Section Deliveries in the previous pregnancies (Table 5).

Among the 508 study participants, 146(28.74%) of women developed MNM conditions making the prevalence rate of Maternal Near Misses rate 28.74% (Figure 2). Most of Maternal near misses conditions are due to unsafe abortion which accounts 72(49.3%) out of 146 near miss cases followed by severe pre-eclampsia 35(24%).

Majority of women 132(90.4%) with MNM conditions were stable during admission to hospital but about 14(9.6%) were critical on arrival to hospital. Most of MNM conditions occurs at home 62(42.5%) followed by health center 53(36.3%). Among MNM conditions, 31(21.2%) happened in this hospital during and after admission. More than three-quarters 122(83.6%) of women with maternal near miss conditions were referred from the nearest health center. Majority 143(97.9%) of women with maternal near miss conditions were admitted to hospital for less than 7 days (Table 6).

Table 3: Health Access, Service Provision and Related Characteristics of the Study Participants' at WSUTRH study population.

Variables	Frequency, N=508	Percent
Health center available, N=508		
Yes	483	95.1
No	25	4.9
Booked for ANC, N=449		
Yes	449	88.4
No	59	11.6
Number of ANC visits, N=449		
At least one visit	82	16.1
2-3 visits	173	34.1
4 visits completed	194	38.2

Table 4: Personal, Administrative and Social Problems Related Characteristics of the Study Participants' at WSUTRH study population.

Variables	Frequency, N=508	Percent (%)
Ever faced medical personnel related problems, N=508		
Yes	5	1
No	503	99
Types of med pro, N=5		
Late diagnosis	2	40
Not polite	3	60
Admin related problems , N=508		
Yes	25	4.9
No	483	95.1
Types of admin related problems, N=25		
Lack of drugs and supplies	15	60
Lack of beds	10	40
Ever Faced Personal Problems , N=508		
Yes	30	5.9
No	478	94.1
Types of personal problems, N=30		
Lack of awareness	19	63.3
Lack of money	9	30
Strong belief on home delivery	2	6.7
Ever faced community related problems, N=508		
Yes	8	1.6
No	500	98.4
Types of community problems, N=8		
Lack of strong participation	2	25
Lack of local transportation system	3	37.5
Poor social bonding	3	37.5

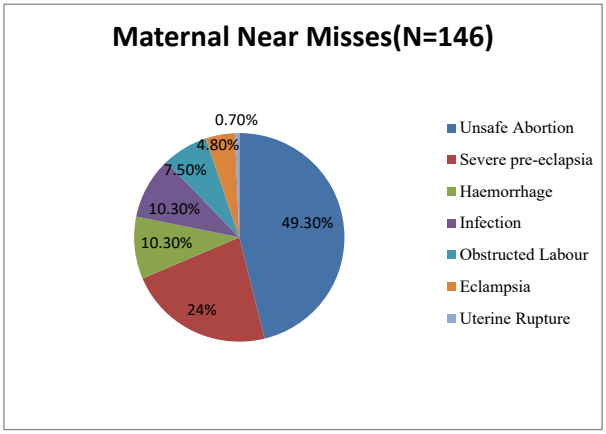

Figure 2: Types & Magnitude of Maternal Near Misses at WSUTRH, Southern Ethiopia from 15th April to 15th June, 2017.

Table 5: Obstetrical Related Characteristics of the Study Participants at Wolaita Sodo University Teaching and referral Hospital.

Variables	Frequency	Percent
Gravidity , N=508		
Primigravida=1st pregnancy	198	39
Multi 2-4 pregnancies	239	47
>/=5 pregnancies or grandmultigravidity	71	14
Parity , N=310		
Primipara	54	17.4
2-4 deliveries	200	64.5
Grand mulipara	56	18.1
Bad Obstetric History, N=310		
Yes	78	25.2
No	232	74.8
Previous C/S, N=310		
Yes	79	25.5
No	231	74.5
LBW, N=310		
Yes	7	2.3
No	303	97.7
VLBW, N=310		
Yes	9	2.9
No	301	97.1
NICU, N=310		
Yes	5	1.6
No	305	98.4
Still Birth, N=310		
Yes	31	10
No	279	90
Early Neonatal Death, N=310		
Yes	26	8.4
No	284	91.6

Multivariate analysis

In multivariate logistic regression women travelling long distance, only one ANC visit, having had bad obstetric history and previous cesarean section and, being primigravida were significantly associated predictors to MNM (Table 7).

Discussions

The frequency of MNM in this study was found to be 28.74% which is comparable the other studies like the study conducted at Debremarkos Hospital making its overall prevalence rate 29.7% [13] and it is slightly higher than the study conducted at three referral hospitals of Amhara regional state with the prevalence of 23.3% [14] and cross sectional study conducted in North India showed that the overall prevalence of maternal near miss was 22.1% by disease specific criteria [15].

As compared to a systematic review at 82 studies conducted at global level in 46 countries which ranges from 0.6-14.8% [16,17] and a multi-center cross sectional study conducted by WHO in eight Latin American showed that the prevalence of MNM of 3.4-4.4% [18] the prevalence rate of MNM of WSUTRH is very highest. This variation may be due to infrastructural access, economic, social, cultural and maternal academic level and wealthiest level among countries. Those countries with better

Table 6: Variables with strong association for Maternal Near Misses in Bivariate Analysis and its frequencies at Wolaita Sodo University Teaching and Referral Hospital.

Variables	MNM Conditions			
	Yes	No	p-value	(95% CI)
	Frequency	Frequency		COR
	N=146			
Distance				
<25km	93	124		**1**
>/= 25km	53	238	0	3.368(95%CI=2.255-5.030)
Ambulance use				
Yes	112	217	0	**1**
No	34	145		2.201(1.421-3.409)**
Booked for ANC follow up				
Booked	45	101	0	**1**
Not booked	14	348		11.075(5.843-20.991)
Number of ANC visits				
At least one visit	32	50	0	**2.764(1.651-4.627)**
2-4 visits	69	298		**1**
Ever faced Medical Personnel related problems				
Yes	58	149	0.01	**1.801(1.151-2.819)**
No	43	199		**1**
Ever faced administrative related problems				
Yes	**15**	**10**	**0**	**4.031(1.766-9.196)**
No	**131**	**352**		**1**
Gravidity				
Primigravida, multigravida(2-4 pregnancies)	**37**	**34**	**0**	3.275(1.959-5.473)***
Grandmultigravidity	**109**	**368**		**1**
Parity				
Primipara, Multipara(2-4 deliveries)	25	31	0.013	0.472(0.260-0.855)
Grandmultipara	70	184		**1**
Bad obstetric history				
Yes	**41**	**54**		3.653(2.131-6.260)
No	**37**	**178**		**1**
Previous Caesarean section				
Yes	**78**	**153**	0.043	1.859(1.018-3.394)*
No	**17**	**62**		**1**
Very low birth weight (< 1500 g)				
Yes	**6**	**89**	**0.03**	**4.764(1.166-19.471)***
No	**3**	**212**		**1**

Note: *Weak association, ** Moderate association & *** Strong association

Table 7: Variables with Strong Association for MNM in Multivariate Analysis at WSUTRH.

VARIABLES	p-value	AOR
Distance		
<25km		**1**
>/= 25km	0.007	**2.358(1.267-4.391)****
Number of ANC visits		
At least one visit	0.033	**2.168(1.066-4.410)****
2-4 visits		**1**
Ever Faced Administrative Related Problems		
Yes	0. 029.	3.686(1.144-11.876)***
No		1
Gravidity		
Primigravida/Multigravida	0.000	.482 (0.235-0.989)*
Grand multigravidity		1
Bad Obstetric History		
Yes	0.013	2.531(1.217-5.265)**
No		1
Previous Caesarean Section		
Yes	0.017	2.610(1.187-5.739)**
No		1

wealthiest quintiles have low rate of maternal near misses cases as compared to countries with low income.

Unsafe abortion (49.3%) is the leading causes of MNM in this study. On contrary to this study other studies like the study conducted at Pakistan Khyber Teaching Hospital Peshawar [19], Nepal [20], South east Iran [21], Mozambique Maputo city [22], Omdurman Maternity Referral Hospital of Sudan [23], rural Hospital in Sudan [9] and rural Referral Hospital in Northern Tanzania [24] showed that the leading causes of MNM was hemorrhage 32.4%, 41.7% , 46.1% , 58% 48.5%, 40.8% and 27% respectively. Variations seen among countries may be associated with improved utilization of partograph and use of active management of third stage of labour that helps to prevent the high burden of PPH and sepsis in this study area. The other thing that it may be associated with the decrease of hemorrhage and sepsis at WSUTRH was may be due to the frequent observation and follow up of laboring women by students' of different discipline since it is teaching and referral hospital.

Women who travel long distance ≥ 25KM were 2.3 times increased odds of developing MNM as compared with women who travel

<25KM with AOR=2.36(95%CI=1.27-4.39) at p value= 0.007. This may be associated with the longer the distance to the hospital is directly related with high chance of delay (Second Delay) that hinders women from receiving obstetric care on timely basis.

Women who had faced administrative problems such as lack of drugs and supplies, beds were more than 3.6 times increased odds of developing maternal near misses as compared to women who never experienced administrative problems with the AOR 3.69 (95%CI=1.14-11.88) and p-value=0. 029. This may be associated with lack of prioritization of supplies and resources for women having obstetric complications by the hospital administrative bodies to save the lives of women developed obstetric complications.

Women having received single ANC visit were more than 2 times increased odds of developing MNM as compared to women who received for twice or more with AOR= 2.17(95%CI=1.07-4.41) at p value= 0.033. The more receiving ANC service repeatedly, the more chance of getting informed on birth preparedness and complication readiness and danger signs of pregnancy that could probably increase awareness of women to visit health facility in early manner that may decrease the number of women visiting with life threatening complications.

Women being Primi/multigravida(2-4 pregnancies) were 52% decreasing odds of developing MNM as compared with women being Grand multigravida with AOR=0.48(95%CI=0.24-.99) p=0.047. This may be due to associated with the increased chance of occurrences of complications when the gravidity and parity increases as compared to primigravida or multigravida.

Women having had bad obstetric history in previous pregnancy is more than 2.5 times increased odds of developing near misses as compared to women who had no bad obstetric history in previous pregnancies with the AOR 2.53 (95%CI= 1.22-5.27) and p-value= 0.013. This may be due to the recurrence of some obstetric complications to occur again in the future pregnancies.

Women who had history of previous C/S were 2.6 times increased odds of developing MNM as compared to women who had no history of previous C/S with AOR=2.61(95%CI=1.188-5.74) at p value =0.017. This may be associated high chance of uterine rupture during labour and delivery due to over stretching.

Limitations of the Study

Missing of some hidden near miss cases was expected due to non-use of laboratory investigations to classify near misses due to inconsistencies and incompleteness of laboratory investigation requests and its results. The study design used by it has an egg-chicken dilemma i.e.it may not show the temporal relationships of MNM and predictors. Some near miss cases such as abortion may tend to be misclassified asunsafe because of lacking full information related with abortion cases like where and how and by whom it was performed.

Conclusions

This study found that the frequency of MNM is 28.74% which is highest as compared to other countries standing at good socio-economic status. Unsafe abortion is the leading cause of MNM conditions in WSUTRH followed by severe pre-eclampsia. Women travelling long distance, women who faced administrative problems such as lack of beds, drugs and supplies, Single ANC visit, having had bad obstetric history and previous cesarean section were found to be positively associated predictors for MNM conditions. Whereas, being primi/multigravida are negatively associated predictors for MNM conditions.

Recommendations

All concerned bodies should work strongly to improve the health conditions of women in order to assure healthy pregnancy and child birth that would ends up with better out comes. Finally we recommend that further study to be conducted on MNM conditions to extract out some hidden cases of MNM conditions due to lacking full laboratory investigations and miss classifications of abortion related cases and some overlapping near miss cases for example severe anemia covered by APH/PPH.

Author's Contribution

WB developed the proposal, conducted data collection, entry, and analysis, writes up and prepared Manuscripts. FH participated during proposal development, data entry and analysis and participated in Manuscript preparation. MM & DD have participated during topic selection, data collection, entry and analysis and finally participated in Manuscript preparation. All authors' read and approved the final version of this manuscript before submission.

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