C7 Efficacy of education DHF

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The Efficacy of Education with the WHO Dengue Algorithm on Correct Diagnosing and Triaging of Dengue-Suspected Patients; Study in Public Health Centre

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ABSTRACT

Background: Correct diagnosing and triaging dengue fever remains clinical, but is difficult because of unspecific flu-like symptoms. Best tool at the moment is the easy–to-use 2009 WHO guidelines. ***Objective*:** To investigate the efficacy of educational intervention with the (adapted and translated) algorithm from the 2009 WHO dengue guideline to healthcare providers in the Indonesian primary health care setting of Central Java. ***Methods:*** Quasi-randomized intervention study implemented in two Public Health Centres (PHCs), one being intervention and the other control. Intervention consisted of educational actions on healthcare providers with a presentation, hand-outs and posters. All patients with fever seen in policlinic or emergency department were included. Data were collected with a participatory observation using the WHO algorithm as a guidance. ***Results:*** Pre-intervention, a total of 88 patients (n=38 intervention group; n=50 in the control group), and post-intervention, a total of 231 patients (n=105 in the intervention group; n=126 in the control group) were included. Pre-intervention, correct diagnosing and triaging was not significantly different (63.2% vs 64.0% ; *p=0.935*), while post-intervention, the intervention group scored higher (75.2% vs 62.7% ; *p=0.041*). However, in both pre- and post-interventional phase, more than 50% of the cases in 19/22 domains were not investigated by the intervention group. ***Conclusion:*** Statistical analyses showed a significantly better outcome in correct diagnosis in the intervention group. However, results are considered inconclusive due to incompleteness of relevant information, which most probably leads to many false positive correct diagnoses and triaging.

Keywords: *DHF, WHO guidelines, primary care setting*

Dengue fever, is a mosquito-borne viral infection that has now spread to most tropical and subtropical regions of the world including Indonesia, and continues to increase in incidence and severity.[(1)] In endemic areas, diagnosis of Dengue Fever is usually made clinically and based on reported symptoms, physical examination and at times a full blood count (haematocrit, WBC and platelets). The actual WHO-guideline from 2009 has been recognized as an authoritative reference worldwide. Different studies have proven the effectiveness of the triaging-system of the guideline especially in recognizing Severe Dengue, and showed clinical and epidemiological usefulness, especially when there are no laboratory tests available[i-3] The WHO algorithm provides a probable diagnosis of Dengue and triages patients into group A (can be sent home), group B (referred for inpatient care), or group C (referred for emergency treatment in hospital). Points for improvement suggested by most studies was re-assessment of warning signs as predictors for severe disease progression.[(1-3)] At the moment, there is no national Indonesian dengue guideline available in the English language. The existing guideline from the Indonesian Ministry of Health also is intended for medical doctors only[(2)].

Preeliminary result of an observational cross-sectional unpublished study about the diagnosis, triaging and management of Dengue Fever in the Public Health Centre (PHC) compared to the 2009 WHO dengue guidelines indicated incomplete history taking and physical examination in 63.9%

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cases. Wrongful triaging happened in 18.5% (group B/C instead of group A) and 25.0% of the cases (group A instead of group B/C) respectively. In interviews with the healthcare providers they confirmed their awareness of the WHO guidelines, however this was not objectified in the study.

Although a complex disease in its manifestations, accurate triaging and management is relatively simple, applicable and inexpensive. In primary healthcare settings where patients are first seen and evaluated, early detection and proper triaging and management are critical in determining better clinical outcomes. This not only prevents unnecessary hospital admissions but also saves lives and helps identifying outbreaks. The local authorities can benefit from having a proper insight into the prevalence, determinants and treatment of Dengue Fever, which facilitates improving health policy (e.q.fair distribution and spending of finances and materials). Aim of this study was to investigate the effectiveness of educational intervention with the (adapted and translated) algorithm from the 2009 WHO dengue guideline to healthcare providers in the primary healthcare setting (PHC).

METHODS

The design of this study was a quasi-randomized controlled trial because concealed randomization was unfortunately logistically not possible in the setting of the research. Two PHCs, were included in this study, one serving as intervention and the other as control. Both PHCs are located in small rural villages of the Jepara regency, Central Java province, Indonesia. Randomly allocation of intervention and control group was done by flipping a coin. In the intervention and control group there are four and three general practitioners respectively and several nurses. According to the WHO guideline, both PHCs have ability to diagnose and triage dengue-suspected patients adequately.

Intervention consisted of education in the form of a 45-minute presentation to all healthcare providers, based on a shortened version of the adopted and translated algorithm of the 2009 WHO guideline for dengue (leaving out the management part). During the presentation it was intensely emphasized that complete history taking and physical examination is crucial for correct diagnosing and triaging of dengue-suspected patients. The presentation included five illustrative example cases in the end that had to be solved (diagnosis and triaging into group A/B/C) by the group to test the gathered knowledge. All cases could be correctly solved by the group. After the presentation, handouts of the algorithm were distributed to all healthcare providers and A3-sized posters were hung up clearly visible in all policlinics and the emergency department.

Picture 1. *Poster of WHO guidelines put in Emergency department*

Data collection was separated into a pre-interventional and post-interventional phase. Patients were selected at their moment of presentation in the policlinic or emergency department and were informed and asked permission about anonymous use of their data with written informed consent or patient´s legal guardian if patient was underage. Healthcare providers in both PHCs were also asked permission to be observed with written informed consent.

In the pre-interventional phase all doctors from both groups were interviewed about their motivations in decision-making for dengue-suspected patients. Data retrieving was done by closely following, observing and interviewing healthcare providers while seeing patients. For laboratory interpretation, national reference values of the PHC were used. Twenty two (22) variables that resemble relevant symptoms and signs for correct diagnosing and triaging of Dengue Fever according to the WHO guideline were observed.

RESULTS

In the pre-interventional phase, 38 patients from the intervention and 50 patients from the control group were included in the study. There was no statistically significant difference in days of fever (*p=0.195*) or in the distribution of setting whether in policlinic or emergency department (*p=0.344*) between the two groups of study. In the post-intervention phase, 105 patients in the intervention group and 127 patients in the control group were included. One patient from control group was excluded because he did not return from laboratory.

Table 1. Completeness of history taking, physical examination and laboratory information

Pre-intervention

Domain	**Intervention Group** n=38 % of cases NOT investigated	**Control Group** n=50 % of cases NOT investigated	***p-value***
History taking			
1) Anorexia and nausea	26.3	14.0	0.147
2) Rash	94.7	62.0	0.000
3) Aches and pains	84.2	56.0	0.005
4) Abdominal pain	71.1	24.0	0.000
5) Persistent vomiting	26.3	6.0	0.008
6) Mucosal bleeding	100.0	94.0	0.255
7) Respiratory distress	100.0	98.0	1.000
8) Coexisting condition	94.7	98.0	0.576
9) Social circumstance	97.4	96.0	1.000
Physical examination			
10) Temperature measurement	71.1	20.0	0.000
11) Tachycardia or bradycardia	78.9	82.0	0.719
12) Hypotension	14.3	44.4	0.025*
13) Respiratory distress	100.0	100.0	n/a
14) Abdominal tenderness	84.2	28.0	0.000
15) Liver enlargement	100.0	78.0	0.002*
16) Clinical fluid accumulation	76.3	20.0	0.000*
17) Mucosal bleeding	97.4	70.0	0.001*
18) Lethargy/restlessness	100.0	98.0	1.000
19) Tourniquet test	100.0	100.0	n/a
20) Petechiae or Rash	92.1	56.0	0.000*
21) CR>2s or cold and sweaty extremities	100.0	98.0	1.000
22) Laboratory information[0]	61.1	20.8	0.000*

Pre-intervention

Out of the 22 domains that were analysed for evaluation of completeness of history taking, physical examination and laboratory examination, in the intervention group only the performance in one single domain was significantly better compared to the control group (investigation of hypotension). There was no statistically significant difference in performance between the groups in 10/22 domains, and in the remaining 11/22 domains the control group scored significantly higher, 4 were in the section of history taking, 6 in physical examination, and 1 in laboratory testing. More than 50% of the cases in the intervention group, 19/22 domains were not investigated, while in the control group this was 14/22 domains (Table 1)

Post-intervention

Table 2 showed the comparison between pre and post intervention in the intervention group. The performance of this group after intervention was better in 9/22 domains, but significantly better in only one single domain (physical examination of mucosal bleeding). Whereas, in 3/22 domains, their performance was significantly better in the pre-interventional phase (investigation of temperature measurement, tachy- or bradycardia, and laboratory testing), and in the remaining 18/22 domains showed no statistically significant difference. In this post-interventional phase, also the intervention group did not investigate in more than 50% of the cases in 19/22 domains.

Table 2. Completeness of history taking, physical examination and laboratory information in Intervention group, Pre- and Post-intervention

Domain	Intervention Group Pre n_2=38 % of cases NOT investigated	Intervention Group Post n_4=105 % of cases NOT investigated	*p-value*
History taking			
1) Anorexia and nausea	*26.3*	*38.1*	*0.192*
2) RASH	94.7	97.1	0.609
3) ACHES AND PAINS	84.2	67.6	0.051
4) ABDOMINAL PAIN	71.1	58.1	0.159
5) Persistent vomiting	*26.3*	*36.2*	*0.269*
6) Mucosal bleeding	100.0	100.0	n/a
7) Respiratory distress	100.0	100.0	n/a
8) Coexisting condition	*94.7*	*99.0*	*0.172*
9) Social circumstance	*97.4*	*100.0*	*0.266*
Physical examination			
10) Temperature measurement	*71.1*	*91.4*	*0.002**
11) Tachycardia or bradycardia	*78.9*	*92.4*	*0.035**
12) HYPOTENSION[+]	14.3	12.7	1.000
13) RESPIRATORY DISTRESS	100.0	97.1	0.565
14) ABDOMINAL TENDERNESS	84.2	79.0	0.492
15) Liver enlargement	100.0	100.0	n/a
16) CLINICAL FLUID ACCUMULATION	76.3	59.0	0.058
17) MUCOSAL BLEEDING	97.4	66.7	0.000*
18) Lethargy/restlessness	100.0	100.0	n/a
19) TOURNIQUET TEST	100.0	97.1	0.565
20) Petechiae or Rash	*92.1*	*94.3*	*0.700*
21) CR>2s or cold and sweaty extremities	100.0	100.0	n/a
22) Laboratory information	*61.1*	*77.9*	*0.049**

Upper Letter: better performance after intervention

Italic : lower performance after intervention

Table 3 showed there was no any statistically significant difference in correct diagnosing/ triaging between intervention and control group in the pre-intervention phase or between pre- and post-intervention phase within the intervention group. However, there was a significant better performance in correct diagnosing and triaging of the intervention group compared to the control group in the post-intervention phase (p=0.041). When this analysis was further stratified by type of healthcare provider (doctor and nurse) between the groups, we calculated a significant better performance only by the nurses of the intervention group compared to the nurses of the control group.

Table 3. Correct diagnosing and triaging in Intervention and Control group Pre & Post interventional

		Intervention Group	**Control Group**	***p-value***
Pre	% of cases correctly diagnosed and triaged	63.2 (n= 38)	64.0 n= 50	0.935
Post	% of cases correctly diagnosed / triaged (total)	75.2	62.7	0.041*
	by doctors	69.8	70.0	0.986
	by nurses	81.0	62.2	0.033*
	p-value	0.215	0.445	
		(n=105)	(n=126)	

Interviewed about motivation of dengue diagnosis and triaging

All doctors from both groups were interviewed about their motivations in decision-making for dengue-suspected patients in the pre-interventional phase. The result of this interviews was concordant between all doctors: patients are first assessed for flu-like symptoms, being fever, weakness, headache, and myalgia or arthralgia. If these symptoms persist already more than three days at time of consultation, patients are referred for laboratory analysis. In the other cases they are sent home for eventual re-evaluation if there is no improvement of symptoms within one day.

Only major indicator for referral to inpatient care is thrombocytopenia. Awareness of relevant clinical signs for diagnosis, warning signs or other admission criteria suggested by the WHO guideline could not be confirmed.

DISCUSSION

The result of this study showed no difference in correct diagnosing between the groups pre-interventional. However in the post-interventional phase, in the intervention group scores of correct diagnosing and triaging were statistically significant better. Comparison by sub-stratification of doctors and nurses between the groups post-interventional revealed significant better performance of doctors in both groups, particularly in domains of physical examination, while the nurses of the intervention group scored significantly better than the nurses in the control group. Thus, the result of this study indicated that the nurses´ better performance in the intervention group compared to the control, which probably made the total better performance in correct diagnosing and triaging.

Overall performance on completeness of relevant information was very poor in both groups, pre- as well as post-interventional with a major part of the relevant domains not investigated in more than 50% of the cases. Therefore, this study can not proved that completeness of relevant informations have correlation with correct diagnosing and triaging, which is most likely attributed to the generally poor performance on completeness of relevant signs and symptoms from history taking, physical examination

and laboratory information. It could also be a source of false positive correct diagnoses and triaging. This is also why the results from evaluation of correct diagnosing and triaging should be regarded inconclusive and should be interpreted with suspicion.

Before intervention, there was no knowledge about the WHO guideline, and thrombocyte count is the main indicator for diagnosis and triaging of Dengue-suspected patients. Based on interview, all doctors indicated that there was no awareness of relevant clinical signs for diagnosis, warning signs or other admission criteria suggested by the WHO guideline. The results of this research revealed huge deficits in relevant history taking and physical examination in both groups, quantitatively as well as qualitatively. This will have negative effects on clinical practice and will lead to wrong diagnosing and thus wrong management of Dengue Fever. To prevent this, very basic history taking and physical examination needs to be improved. Different studies have proven the effectiveness of the triaging- and management-system of the guideline especially in recognizing Severe Dengue, and showed clinical and epidemiological usefulness[1-3], especially when there are no laboratory test available. The failing of this intervention to have a positive effect on measured outcomes can be caused by the limited time of education (only 45 minutes powerpoint presentation), which can be considered as not enough to make sure the understandable of the audiens. Besides, this intervention did not followed by test of knowledge about 22 domain before started with post-interventional data collection.

There are also several factors in this study that might lead to over- or underestimation of certain outcomes. Factors that could lead to overestimation in performances of the healthcare providers in general are the Hawthorne effect, and the dubious manner of execution of certain physical examination techniques, which were not reliable but were often considered as investigated (blood pressure measurement, investigation of rash/ petechiae, investigation of clinical fluid accumulation). Furthermore, on the survey when signs or symptoms were filled in as "investigated", it is not possible to differentiate between if patients reported the symptoms themselves or if the healthcare provider asked actively. When only very few signs and symptoms were investigated by a healthcare provider, this could quickly lead to a false positive labelling in the analyses. The latter two could thus also lead to an overestimation in performance of healthcare providers. Moreover, factors that might underestimate the performance of healthcare providers are the slightly alternated use of thrombocytopenia and increased haematocrit as warning signs, which is gives possibly more diagnosed patients and more patients triaged into group B.

Considering the fact that the previous study (unpublished) as well as this study concluded that basic relevant history taking and physical examination are very deficient for Dengue diagnosis in this setting, further research should primarily focus on investigating and improving that point before concentrating on other clinical outcomes, like correct diagnosing and triaging or management. A longer timeframe for data collection is recommended as this not only gives more samples cohort but also can be used to measure the consistency of healthcare providers behaviour.

In conclusion, although statistical analyses showed a significantly better outcome in correct diagnosis and triaging in the intervention group, the results of this study are considered inconclusive due to the incompleteness of several relevant informations, which most probably leads to many false positive correct diagnoses and triaging.

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