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Original Article

Prevalence of Obesity and Metabolic Derangement Among the Rural Population of Kiulu District of Sabah, Malaysia: A Health Screening Programme Findings

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ABSTRACT

Malaysia has high prevalence of general and central obesity which can be signified by measurements of BMI and waist circumference respectively. Both parameters are established risk factors and predictors for non-communicable diseases including diabetes and hypertension. A health screening programme was conducted in a rural district of Sabah, Malaysia where a total of 42 participants were examined for weight, height, BMI, waist circumference, systolic and diastolic blood pressure, pulse rate and capillary blood glucose. Mean age of the participants was 52.4 ± 14.9 years old. General obesity based on BMI was 42.9% while central obesity based on waist circumference was 26.2%. Proportion for hypertension and hyperglycaemia were equal at 33.3%. BMI was strongly correlated to waist circumference (r = 0.873, p < 0.001). Moreover, both BMI and waist circumference were independently correlated with systolic blood pressure (r = 0.418, p = 0.006 and r = 0.383, p = 0.012 respectively). Finally, systolic blood pressure was directly correlated with weight of the participants (r = 0.350, p = 0.023). These findings were found to be closely similar and comparable to currently available epidemiological data.

Keywords: obesity, metabolic derangement, rural population, health screening

INTRODUCTION

Malaysia has higher prevalence of obesity than the world prevalence with approximately 1 in every 2 Malaysians (50%) are obese[1]. In 2016, WHO reported that the global prevalence of obesity was 13% in adults aged 18 years and older[2]. Obesity is strongly associated with various chronic non-communicable diseases including diabetes and hypertension that may lead to more severe complications such as heart diseases[3 – 5]. Sedentary lifestyle and lack of physical activities are major contributors for obesity[6, 7]. The National Health and Morbidity Survey in 2015 reported that although the overall self-reported physical activity were quite high in Malaysian population (66.5%), only 25.4% were HEPA active (HEPA: health-enhancing physical activity; highly active category) while the other 41.1% were only active minimally[8]. In contrast, other research have found that Malaysia was one of the least active countries in the world with more than 50% of men and women aged 15 years and older to be physically inactive[9]. In relation to that, sedentary lifestyle and prevalence of obesity were comparatively lower in rural residence than urban populations[10]. This might indirectly affect the prevalence of non-communicable diseases and general health of rural communities as a whole.

Indeed, previous studies have reported higher prevalence of hypertension in urban than rural population though they differ only slightly (10.1% versus 9.7%)[11]. Furthermore, the prevalence of hypertension was also high in urban men and women than among rural men and women (16.4%, 12.1%, 5.4% and 5.9% respectively)[12]. Meanwhile, urban population had two-fold larger proportion of diabetes mellitus than its rural counterpart measuring at 8.1% and 4.6% respectively[13]. Epidemiological studies have identified higher BMI and waist circumference as risk factors and strong predictors of these chronic medical illnesses. Development of these diseases usually take years without external symptoms. Often times,

patients seek medical help from healthcare professionals when they were already in late stage of the diseases. This delineates the importance of conducting serial health screening in apparently healthy general population from time to time.

Rural communities have restricted access to modern medical facilities leading to inequalities of medical services as compared to urban population especially in economically under-developed and developing countries[13 – 15]. In Malaysia, primary healthcare centres known as Klinik Kesihatan have been set up to cater for these communities[16]. Apart from providing treatment for minor illnesses, rural health teams also conducted series of health camps to educate the community regarding healthy lifestyle as well as to screen for various non-communicable diseases along with assessment of their risk factors. This paper reported the findings during health screening in a rural community in the Kiulu District of Sabah, Malaysia. The programme was jointly conducted by the Department of Biomedical Sciences and Therapeutics, Faculty of Medicine and Health Science, Universiti Malaysia Sabah and the Kiulu Health Clinic, Sabah State Health Department, Ministry of Health Malaysia.

MATERIALS AND METHODS

This health screening programme was conducted at the Kiulu District of Sabah, Malaysia in April 2016. Convenience sampling method was used whereby every person registered and participated for the health screening activities was included in this study. They represented six different rural villages that are located within the district.

Anthropometry

Age and gender of the participants were recorded before proceeding to the health screening stations. Weight of the participants were measured using a standard weighing scale. Participants were weighed on their loose clothing and without shoes. Heights were measured by using a standard stadiometer. Participants were instructed to stand with their back straight and measurements were taken when the stadiometer head plate lightly rested on the participants' head.

The body mass index (BMI) were calculated using the formula BMI = [weight (kg) ÷ height^2 (m^2)]. World Health Organization (WHO) International Classification for Asian population were adopted to categorize the BMI of the participants[17]. A BMI of ≤27.4 kg/m^2 was categorized as non-obese while BMI of ≥27.5 kg/m^2 was categorized as obese.

Waist circumferences (WC) were measured by using a measuring tape wrapped around the abdomen horizontally at the level of iliac crest while participants were at tidal respiration. According to the measurement, the participants were categorized into normal and centrally obese based on the widely accepted cut-off points for WC[18]. For male, cut-off points were set at ≤102 cm for normal and >102 cm for centrally obese. Meanwhile for female, cut-off points were set at ≤88 cm and >88 cm for normal and centrally obese respectively.

BLOOD PRESSURE, PULSE RATE AND CAPILLARY BLOOD GLUCOSE MEASUREMENT

Blood pressures were measured using electronic blood pressure device (Omron® SEM-1) after 5 minutes of rest. The right arm was supported at the heart level and appropriate-sized cuff was applied. Blood pressures were categorized into normal (≤139/89 mmHg) and hypertensive (≥140/90 mmHg) according to the Joint National Committee-8 (JNC-8) criteria[19]. Pulse rate of the participants were also measured for one minute at right radial artery after each blood pressure measurement. Lastly, capillary blood glucose levels were measured using standard glucometer device (Accu-Chek® Performa). Normal and hyperglycaemia were defined as capillary blood glucose ≤7 mmol/L and ≥7.1 mmol/L respectively according to Malaysian Clinical Practice Guideline[20].

Statistical analysis

The data collected were entered into IBM® SPSS® Statistics (Version 23) software for analysis. Data from both male and female participants were combined to improve the power of statistical analysis. Continuous parameters were expressed in mean ± standard deviation (SD). Association among various parameters were analysed by performing Pearson correlation coefficient test.

RESULTS

Participants in the health screening programme were aged between 19 to 75 years old with the mean age of 52.4 (SD = 14.9) years. Mean and SD for other parameters were summarized in Table 1.

Table 1 Descriptive analysis

Parameters	Mean ± SD	Min.	Max.
Age (years)	52.4 ± 14.9	19	75
Weight (kg)	60.1 ± 11.3	35.8	85.0
Height (cm)	151.2 ± 7.9	140.0	172.0
Body mass index (kg/m^2)	26.2 ± 4.2	17.6	36.6
Waist circumference (cm)	87.6 ± 11.1	66.0	109.0
Systolic blood pressure (mmHg)	131.1 ± 18.1	103	176
Diastolic blood pressure (mmHg)	78.7 ± 9.4	61	97
Pulse rate (bpm)	83.6 ± 10.9	60	102
Glucometer (mmol/L)	6.5 ± 1.3	4.7	9.4

Mean and standard deviation (SD) were used to measure the central tendencies and dispersion for all parameters.

Table 2 Frequencies and relative frequencies for body mass index, blood pressure, waist circumference and capillary blood glucose

Parameters		n	%
Body mass index (BMI)	Non-obese	24	57.1
	Obese	18	42.9
Blood pressure (BP)	Normal	28	66.7
	Hypertensive	14	33.3
Waist circumference (WC)	Normal	31	73.8
	Centrally obese	11	26.2
Capillary blood glucose (Glu.)	Normal	28	66.7
	Hyperglycaemia	14	33.3

Table 3 Measurement of central obesity based on waist circumferences

WC	Male, n (%)	WC	Female, *n* (%)	Total, *n* (%)
≤102 cm	16 (100.0)	≤88 cm	15 (57.7)	31 (73.8)
>102 cm	0 (0.0)	>88 cm	11 (42.3)	11 (26.2)

Table 4 Pearson correlation coefficient among Wt., Ht., SBP, DBP, PR and Glu.

		Wt.	Ht.	SBP	DBP	PR	Glu.	BMI	WC
Wt.		1							
Ht.	*r*	0.572	1						
	Sig.	0.000[b]							
SBP	*r*	0.350	0.032	1					
	Sig.	0.023[a]	0.843						
DBP	*r*	0.340	0.225	0.390	1				
	Sig.	0.028[a]	0.151	0.011[a]					
PR	*r*	0.169	0.213	–0.003	0.360	1			
	Sig.	0.285	0.176	0.985	0.019[a]				
Glu.	*r*	0.238	0.021	0.106	–0.073	–0.030	1		
	Sig.	0.128	0.894	0.506	0.647	0.852			
BMI	*r*	0.809	–0.015	0.418	0.266	0.065	0.259	1	
	Sig.	0.000[b]	0.926	0.006[b]	0.089	0.680	0.097		
WC	*r*	0.824	0.186	0.383	0.186	0.048	0.196	0.873	1
	Sig.	0.000[b]	0.238	0.012[a]	0.239	0.765	0.212	0.000[b]	

[a] Correlation is significant at the 0.05 level (2-tailed).
[b] Correlation is significant at the 0.01 level (2-tailed).
Abbreviation: Wt. = weight, Ht. = height, SBP = systolic blood pressure, DBP = diastolic blood pressure, PR = pulse rate and Glu. = capillary blood glucose.

Almost half of the participants were categorized as obese (n = 18, 42.9%) with mean BMI of 26.2 kg/m^2 (SD = 4.2). About one-third were hypertensive (n = 14, 33.3%) whereas the other two-third had normal blood pressure (n = 28, 66.7%) (Table 2). In contrast to BMI, much less proportion of the participants had central obesity (n = 11, 26.2%) with their waist circumferences fell above the gender-based cut-off points (Table 3). Mean waist circumference was 87.6 cm (SD = 11.1). Similar to blood pressure, only one-third of the participants had high capillary blood glucose (n = 14, 33.3%) while the other one-third were normoglycemic (n = 28, 66.7%). Mean capillary blood glucose was 6.5 mmol/L (SD = 1.3).

Pearson correlation coefficient test were performed to look for association among various parameters measured on participants of this health screening programme (Table 4). Weight was strongly correlated with BMI (r = 0.809, $p < 0.001$) and waist circumference (r = 0.824, $p < 0.001$). Positive correlation was also seen between weight and both systolic and diastolic blood pressure ($r = 0.350$, $p = 0.023$ and $r = 0.340$, p = 0.028 respectively). Additionally, weight had direct correlation with height (r = 0.572, $p < 0.001$). Systolic blood pressure was found to have positive correlation with diastolic blood pressure (r = 0.390, p =0 .011) while diastolic blood pressure was positively correlated with the pulse rate ($r = 0.360$, $p = 0.019$). Meanwhile, positive correlation was also seen between BMI and systolic blood pressure (r = 0.418, p= 0.006) as well as BMI with waist circumference ($r = 0.873$, $p < 0.001$).

DISCUSSION

This paper reported on the findings obtained during a health screening programme conducted in Kiulu; a rural district community in Sabah, Malaysia. This half-day programme consisted of health educational talks, blood donation drive and health educational booths along with general health screening[21]. While the programme attracted a big crowd, only a handful participated in the health screening activities resulted in a small number of participants

(n = 42). Hence, parameters from both men and women were combined to increase the power of statistical analysis.

Mean age of 52.4 ± 14.9 years old reflected that the population in this district was mainly composed of middle-to older-aged group as younger generation tend to migrate to the urban region. Among these participants, the BMI showed strong positive correlation with the waist circumference similar to other study (r = 0.873, p < 0.001 vs r = 0.78, p < 0.01)[22]. Additionally, based on BMI, nearly half of the participants had general obesity whereas according to waist circumference, only one-quarter (26.2%) had central obesity. These findings reflect current epidemiological statistics in which approximately every 1 in 2 person in Malaysia has obesity as was reported by Chan et al. (2017)[1]. Using similar cut-off points for waist circumference of >102 cm for men and >88 cm for women, the Malaysia national prevalence of central obesity in 2015 was reported at 23% which was almost equal with our data[8].

Currently, there is a growing support for measurement of WC in complement to BMI in determining the obesity status that corresponds to higher risk of having several non-communicable diseases including diabetes, hypertension and cardiovascular diseases[23 – 26]. This is in part due to the inaccuracy of BMI to differentiate between lean mass and adipose mass; thus, reduces the efficiency of BMI to classify obesity especially in person with larger percentage of muscle tissue such as muscle builders and those who are highly active[27]. Therefore, higher BMI may not truly reflect obesity among the participants. Since rural population commonly engaged in high physical activities such as farming, gardening and other labour intensive activities, their muscle mass might be larger which might result in higher BMI[28, 29]. Lower percentage of obesity as determined by WC in this report was not only conform to the national prevalence, it also corresponds to findings from previous studies. For example, a study conducted in rural regions from four states of India found that abdominal obesity was ranged between 8.7% to 32.1% and they were statistically lower than the urban populations of the same states[30].

Apart from that, participants of this health screening programme had percentage of hypertension and hyperglycaemia of 33.3% for both parameters which were comparable to previous findings. Among two rural communities from a Northern Peninsular state of Malaysia, 50 out of 168 subjects were reported to be hypertensive with a prevalence rate of 29.8%[31]. On the other hand, another study conducted among rural residence of Vietnam found that the combined crude prevalence for impaired fasting glucose (IFG), impaired glucose tolerance (IGT) as well as diabetes was recorded at 17.3% (or 9.2%, 4.4% and 3.7% respectively)[32].

Even though high measurement of WC and BMI are established risk factors and predictors for diabetes mellitus and hyperglycaemia as reported by various studies[23], current report showed otherwise. There was no significant correlation between glucose level with either WC or BMI that can be partly explained by small number of participants in this health screening. Recruitment of more subjects by conducting longer duration of health screening program as well as organized visit into the heart of these villages may lead to changes in the current findings.

Otherwise, there were strong positive correlation between both BMI and WC with systolic blood pressure which was comparable to previous report. Mohammadifard et al. (2013)[25] found that among 12,514 adult participants in the Isfahan Healthy Heart Program, prevalence of hypertension in both male and female were significantly associated with higher quartile of BMI and WC with p < 0.001. In addition, a cross-sectional study by Gierach et al. (2014) found that among 839 Peruvian patients diagnosed with metabolic syndrome, BMI or WC were strongly correlated with arterial hypertension (r = 0.63, p < 0.05).

CONCLUSION

Findings during this health screening programme were comparable to several currently available data despite having small number of participants. Further studies are recommended to include larger sample size as well as equal inclusion of subjects from various villages in rural districts of Sabah. Apart from that, more detail assessment regarding demography, physical activities and other risk factors for obesity as well as non-communicable diseases need to be addressed in future studies to truly reflect the health status of rural communities in Sabah.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests in publishing this paper.

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Original Article

Study of Ebola Virus Outbreak Dynamics, Impact of Vaccination and Other Preventive Measures on Transmission Control

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ABSTRACT

Ebola virus disease (EVD) is an emerging and remerging zoonosis associated with high fatality rate, mainly caused by the Zaire Ebola virus (ZEBOV) and Sudan Ebola virus (SEBOV) strains. Approximately 20 epidemics of EVD have been documented mainly in Central African countries since 1976. Currently, there are no therapeutics agents and vaccines yet approved for EVD. However, several promising therapeutics and vaccines candidates are actively undergoing various phase of clinical development. This study aims to study the EVD dynamics and evaluate the potential impacts of vaccines and other preventive measures on EVD transmission control and significance of medical intervention on outcome of the disease. An initial branch chain model of EVD dynamics was built based on data obtained from previous study. Different epidemiological scenarios for EVD with impacts of intervention were simulated using Berkeley-Madonna Version 8.3.18 software. Every reduction in the exposure rate of EBV infection by 10% produces two- to five-fold improvement in protection against EVD. Transmission control is optimum when the rate of exposure to EBV infection is reduced below 1%. Optimal control of EVD transmission can be achieved through strategic implementation of successful vaccination programme, and other preventive measures as well as rapid delivery of supportive medical care.

Keywords: Ebola virus disease, Zaire Ebola Virus, Sudan Ebola Virus, epidemics, vaccines, epidemiological model

INTRODUCTION

Ebola virus disease (EVD) is a severe haemorrhagic febrile illness caused by Ebola virus (EBV) infection. It is an emerging and re-emerging zoonosis and associated with high mortality rate[1, 2]. EVD first appeared in 1976, with two simultaneous outbreaks; one in Nzara, Sudan involving 284 cases with 151 deaths (53%), and another in Yambuku (near Ebola River) in Democratic Republic of Congo where 318 cases were reported with 280 casualties (88%)[3]. Since the first two-epidemics, approximately another 20 outbreaks were recorded in the following years mostly involving Central African countries, until the recent largest and most complex outbreak of EVD in West African countries (2014 – 2016).

The recent EVD outbreak recorded higher number of deaths than all previous outbreaks combined. The outbreak started in Guinea before spreading across the land borders to Sierra Leone, Liberia, Mali, and Senegal and later to Nigeria, Europe and North America by the mean of air travellers (Figure 1). A total of 28,616 cases were reported as of March 2016 with 11,005 fatalities (39%)[4].

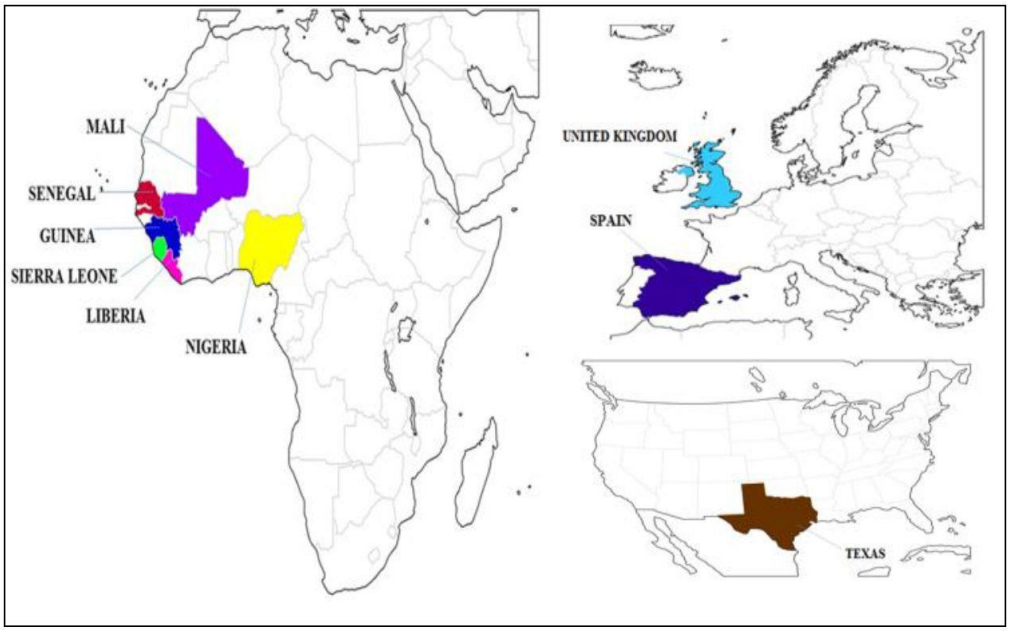
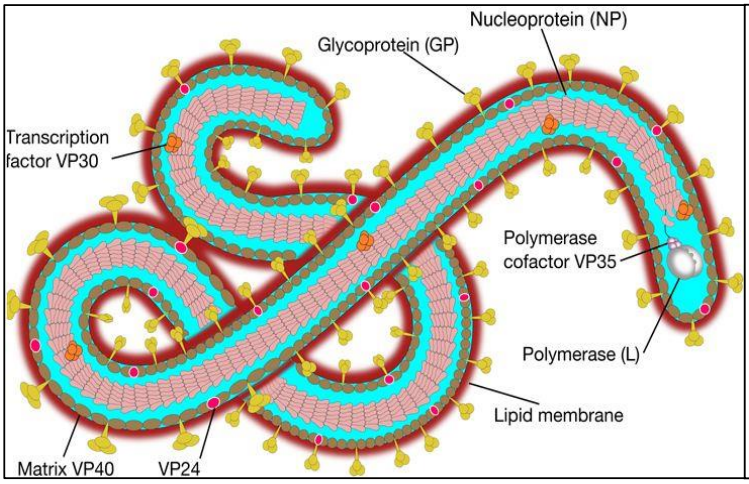


Figure 1 Distribution of EVD outbreaks in 2014 – 2015. The outbreak begins in West African countries before it spread to other distant countries by the means of air travelling[5].

EVD outbreak occurs mostly in African countries. The natural environment in the continent favours the survival of Ebola virus. This includes wide distribution of EBV natural and alternate hosts such as fruit bats, apes and monkeys, and suitable temperature for the virus to survive throughout the year[6]. In addition, poor healthcare system, lack of basic infrastructures, human and economic resources and political instability in African countries further complicates the control of the outbreak.

EBV is a polymorphic, negative sense RNA virus belongs to the (family) *Filoviridae* (Figure 2). There are five identified strain of EBV; Zaire Ebola Virus (ZEBOV), Sudan Ebola Virus (SEBOV), Bundibugyo Ebola Virus (BEBOV), Tai Forest Ebola Virus (TEBOV) and Reston Ebola Virus (REBOV)[7]. The first three have been responsible for the large outbreaks in Africa in which ZEBOV identified causing the recent epidemic in Africa[1]. REBOV is not associated with human disease while ZEBOV is the most virulent and causes the highest fatality rate (more than 90%)[8, 9].



The 19-kb long EBV genome has seven open reading frames encoding structural proteins that include nucleoprotein (NP), virion envelope glycoprotein (eGP), matrix protein VP24 and VP40, non-structural proteins such as VP30 and VP35, and viral polymerase. These ribonucleoproteins complex have distinct roles in pathogenesis of EVD[10].

Figure 2 Schematic diagram of the structure of EBV

The high fatality rate associated with Zaire Ebola Virus strain is related to its ability to initiate intense innate immune response which characterized by the 'cytokine storm', as observed in some other severe form and fatal case of infection (e.g. H5N1 Influenza, smallpox, etc.). It also causes global suppression of adaptive immunity which is characterized by very low-level circulating cytokines produced by T-lymphocytes and massive loss of peripheral CD4 and CD8 lymphocytes[11].

Transmission of EBV to humans can occur by indirect contact with contaminated environment or direct contact with body fluids of infected patients[12]. The main routes of entry of EBV infection into human body are the mucous membrane, conjunctiva and skin abrasions[13]. Healthcare workers and family members of infected persons are particularly at risk of acquiring infection.

Through skin and mucosa access, EBV disseminates into blood stream by infecting target monocytes, macrophages and dendritic cells before it spreads to the liver and spleen and regional lymph nodes. The infected macrophages and monocytes will release a very high concentration of pro-inflammatory cytokines in blood stream, which then initiate inflammatory reaction causing damage to the affected normal tissues and microcirculation[5, 14]. Extensive damage to endothelial vessel will leads to massive haemorrhage.

The incubation period following infection is usually five to nine days but can vary between two to twenty-one days[12]. The symptoms may initially appear as flu-like symptoms and gastrointestinal symptoms such as stomach ache, vomiting and diarrhoea. At a later stage, complications may occur with evidence of internal or external bleeding and multi-organ failure and finally death[5].

There are no effective vaccines and therapeutic agents available for EVD before, but several therapeutics and vaccines candidates are currently undergoing various phase of clinical development. Two of most promising vaccine candidates are ChAd3-ZEBOV and rVSV-ZEBOV. rVSV-ZEBOV is a replication-competent, life attenuated, recombinant vesicular stomatitis virus, which genetically engineered to express ZEBOV strain glycoprotein as immunogen[15, 16]. Result from Phase III open-label, cluster-randomised clinical trial conducted in Guinea in 2016 by WHO and collaborators show that the vaccine is highly protective against EBV[17].

While ChAd3-ZEBOV is a vaccine derived from chimpanzee adenovirus, Chimp Adenovirus type 3. The vaccine genetically engineered to express glycoprotein from two EBV strains, ZEBOV and SEBOV. It provokes immune response against EBV and have demonstrated 100% efficacy in previous non-human primates' study[18, 19].

The mainstay treatment of EVD begins with an early recognition of the disease and delivery of effective supportive care. Supportive medical care, when given early can significantly improve survival[20]. The lack of availability of medical facilities or difficulties in getting the access to medical care in poor African countries may contribute to high fatality cases in previous outbreaks[21, 22].

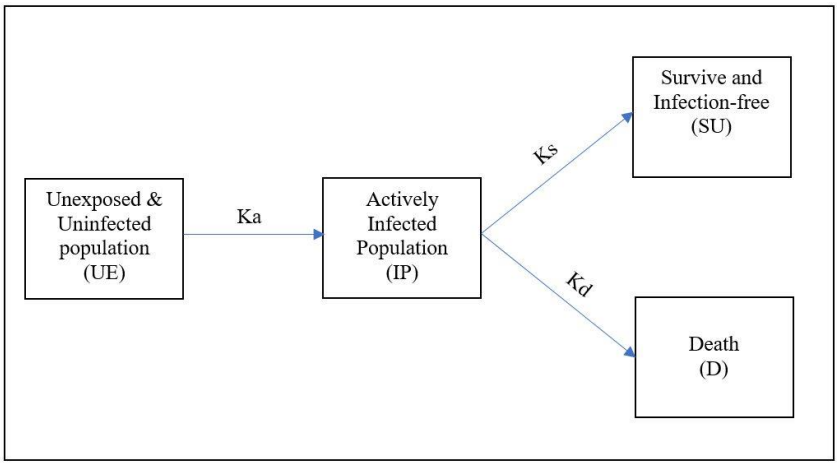
The main objective of this study is to explore the nature of EVD dynamics through construction of mathematical modelling. It allows for critical analysis of EVD dynamics based on different epidemiological scenarios generated by various key factors. The hypothetical scenarios to be tested include when the exposure rate is at 30% before it is being reduced to 20%, 10% and 1%, while the death and survival rate are fixed. Other aim is to investigate the significance of time intervention when the outbreak is fully controlled at different time intervals. This model could help researchers and public healthcare providers to understand the dynamics of EVD better and it potentially becomes a useful tool for early assessment of impact of vaccination and other preventive measures on EBV transmission control.

METHODOLOGY

An initial branch-chain epidemiological model was developed which consists of initial unexposed and uninfected population (UE) and post exposure group which were classified into three categories; infected population (IP), survivors of the disease (SU) and death (D). Epidemiological parameters tested include exposure rate constant (Ka), survivals rate constant (Ks) and death rate constant (Kd).

This epidemiological model was fitted on, where applicable, data published from previous EVD outbreaks. Data used from literature review include; EVD fatality rate (Kd) range from 20% to 90% and EVD survival rate (Ks) range from 10% to 80%[2]. Ka value was based on estimation to simulate few theoretical environments for EVD. In this model, following assumptions were also been made; the initial population in a region is 100 000 people, entire population was considered susceptible to the infection, the nett of birth rate and death case due to natural cause as well as immigration or emigration rate within the year to be zero.

The model is represented in the schematic diagram as shown in Figure 3.



UE = Unexposed and uninfected population, IP = Actively infected population, SU = Survived patient, D = Death, Ka = Exposure rate constant, Ks = Survival rate constant, Kd = Death rate constant

Figure 3 Schematic diagram of proposed basic epidemiological modelling of EVD

From the model in Figure 3, following differential equations (Figure 4) were derived and tested with Berkeley Madonna Version 8.3.18 software, for simulation of various epidemiological scenarios. Graphs of number of healthy people, infected people, survivals, death vs time were then generated for interpretation.

For unexposed and uninfected population (UE):
$UE = UE_0 - (IP_t + SU_t + D_t)$
with time; $d/dt(UE) = UE_t - (Ka \times UE_t)$

For infected population (IP):
$IP = (Ka \times UE) - (SU_t + D_t)$
with time; $d/dt(IP) = IP_0 + (Ka \times UE_t) - (Ks \times IP_t) - (Kd \times IP_t)$

For survival people (SU):
$SU = Ks \times IP$
with time; $d/dt(SU) = SU_0 + (Ks \times IP_t)$

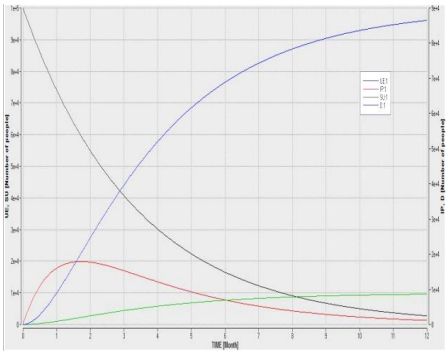
For death case (D):
$D = Kd \times IP$
with time; $d/dt(D) = D0 + (Kd \times IP_t)$

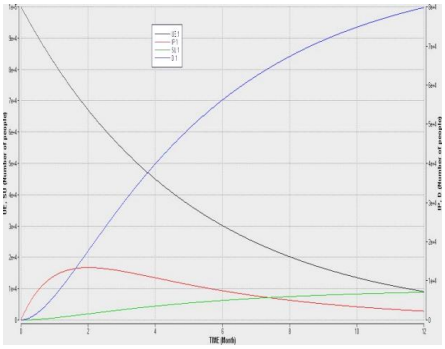
Initial UE =100000
Initial IP = 0
Initial SU = 0
Initial D = 0

Figure 4 Differential equations derived from the model for estimation number of protected and affected population

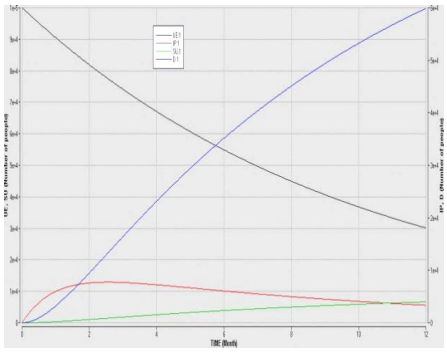
RESULTS

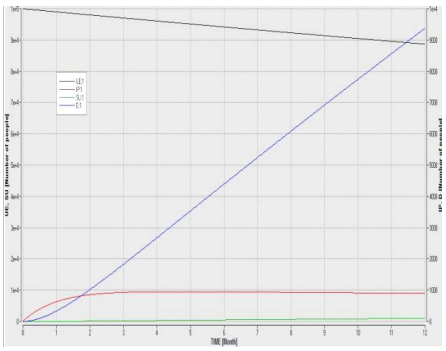
(A) (B)





(C) (D)





The left axis of the graph represents the number of people for uninfected population (UE: black line) and survivals (SU: green line), while on the right axis of the graph it represents the number of people for infected population (IP: red line) and number of people died (D: blue line) over one-year outbreak.

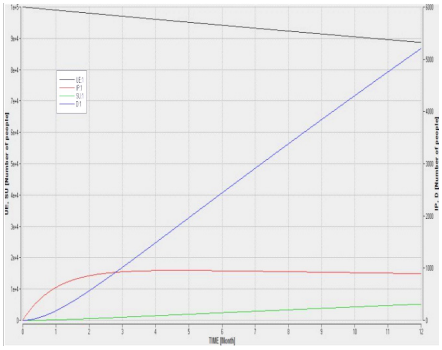
(A) When Ka = 0.2, Ks = 0.1 and Kd = 0.9, the EVD-free population had declined to 12% from the initial population comprising both of uninfected people (2732 people) and survivors of EVD (9610 people). About 1% (1171) of the population remain actively infected.

(B) When Ka = 0.2, Ks = 0.1 and Kd = 0.9, the number of EVD-free population declined to 18% from initial number of population over the year, comprising both uninfected population (9072) and EVD survivors (8866). There are about 2% (2268) of the population who remain actively infected.

(C) When Ka = 0.1, Ks = 0.1, and Kd = 0.9, the number of EVD-free population declined to 37% from initial number of population over the year, comprising both uninfected population (30119) and EVD survivors (6653). There are about 3% (3347) of the population remain actively infected.

(D) When Ka = 0.01, Ks = 0.1 and Kd = 0.9, almost 89% of population are free from the disease. However, about 11% from total population affected by EBV infection resulted with 9371 deaths and 1041 survivals. Less than 1% of population remain actively infected.

Figure 5 Graph population vs time (month) with fixed Ks = 0.1 and Kd = 0.9



When Ka = 0.01, Ks, Kd = 0.5. Improvement in survival rate up to 50%, thus reducing the fatality rate to 50%, and with infection rate kept at 1%, the impact of EBV on population is minimal. Almost 89% of population are free from the disease (blue line). From 11% affected population, 5206 of them survives and less than 1% of population remain actively infected.

Figure 6 Graph population vs time (month) with fixed Ka = 0.01

Table 1 Summary of cumulative impacts on population density when there is changes in exposure rate constant (Ka) in one-year EVD outbreak.

	Number of people/cases			
Epidemiological Variables	**Uninfected & Unexposed population [UE]**	**Actively infected population [IP]**	**Survivals [SU]**	**Death [D]**
Ka = 0, Ks = 0, Kd = 0	100 000	0	0	0
Ka = 0.3, Ks = 0.1, Kd = 0.9	2732	1171	9610	86487
Ka = 0.2, Ks = 0.1, Kd = 0.9	9072	2268	8866	79794
Ka = 0.1, Ks = 0.1, Kd = 0.9	30119	3347	6653	59881
Ka = 0.01, Ks = 0.1, Kd = 0.9	88692	896	1041	9371
Ka = 0.01, Ks = 0.5, Kd = 0.5	88692	896	5206	5206

Table 2 Summary of cumulative number of uninfected people and number of death case according to time interval when Ka = 0.01, Ks = 0.1, Kd = 0.9

Time interval	Cumulative number of uninfected people	Cumulative number of death case
3 months	97045	1823
6 months	94177	4387
9 months	91393	6915
12 months	88692	9371

The model was first tested against different values of exposure rate constant, Ka (0.3, 0.2, 0.1 and 0.01), while survival rate (Ks) and death rate constant (Kd) remain the same, at 0.1 and 0.9 respectively.

When Ka value was set at 0.3 (Figure 5-A), i.e. the population was exposed to 30% infection rate, a huge change in demographic pattern can be observed. The population density had drastically decreased to about 12% from initial total population, comprising both healthy uninfected individuals and survivor of the disease; with another 1% of population remain actively infected.

When Ka was tested at 0.2 i.e. 20% exposure rate (Figure 5-B) similar changes in demographic pattern also can be seen. Less than 10% of population being protected and 8% were survivals from the disease. However, a further reduction by 10%, i.e. when Ka = 0.1, the study shows there was significant improvement in terms of impact on population and disease survivals. 31% of population were protected from disease, 7% are survivals from the disease, while 3% remain actively infected.

The model was then tested with Ka value being reduced to 0.01 i.e. 1% of exposure rate (Figure 5-C). Tremendous improvement can be observed, in which almost 90% of population are protected from the disease throughout the epidemics, with less than 1% remain actively infected.

In second test, the model was tested against different values of survival rate, Ks and death rate constant, Kd. Ks and Kd value was changed to 0.5 respectively, while Ka value is kept at 0.01 (Figure 5-D). When Ks is change from 0.1 to 0.5 (thus Kd value from 0.9 to 0.5), there was five-fold increase in number of disease survivors (from 1041 to 5206) and the number of death case reduced to halve.

Another noteworthy observation made here is the significant of time of intervention (Table 2). If effective measures taken to halt the outbreak within 3 months, about 97% of population can be protected from the disease. At 6 months, about 94% of population are still free from the disease. However, if the outbreak continues, it will claim more casualties. It is estimated that, by 9 months, 10% of population will be affected with the disease with 6915 death cases, and by 12 months interval, more than 11% of the population will be affected with 9371 deaths.

DISCUSSION

An initial branch-chain epidemiological model was constructed as a basis to understand EVD dynamics, identifying different epidemiological variables and its influence on epidemics, and early assessment of potential impact of intervention particularly vaccination and other preventive measures.

On the first set of tests, the study aims to establish dynamics of EVD when there is a change in exposure towards EBV infection. The assessment was done by observing in terms of cumulative impacts on population density, number of survivors, number of actively infected population and number of death case.

First, the result demonstrated the extent of devastating impacts of EVD when there was inefficiency in controlling the spread of infection. The density of population markedly reduced and casualty was very high. This simulation may reflect one of the worst possible case-scenarios. However, it is mere theoretical, as in real situation, spread of infection could reach saturation after certain period, and this huge outbreak will prompt global intervention to prevent uncontrolled spread of infection and improve survivals.

The study also made another significant observation from the first test; the reduction of Ka values has produced ‘point of inflexion’ especially when Ka value was reduced from

0.1 to 0.01, compared to when Ka value was reduced from 0.3 to 0.2 or 0.2 to 0.1. It produced more than double improvement in the number of uninfected population (increase of 58,843 populations) and reduction of death case (reduction of 50,510 case) compared to when Ka value being reduced from 0.2 to 0.1.

This could reflect the significant impact of preventive measures taken to halt the outbreak. One of the most effective way is vaccination programme. To be successful, it requires mass of population need to be vaccinated to produce herd immunity. However, in practical, it is almost impossible to vaccinate entire population for multiple reasons include logistic problem, socioeconomic burden, cultural beliefs and attitude towards vaccination.

The model however, shows that even when Ka is brought down to 1%, there are still considerable numbers of population are at risk for getting infection. This could reflect that in situation where population who do not receive vaccination potentially become the source of spreading of infection and further, diminish herd immunity. Moreover, around 5% to 15% vaccinated people may not successfully develop immunity against the disease[23].

Therefore, to aggressively control the outbreak, it is going to require not only a successful vaccination programme but combination strategy with other preventive measures. Dissemination of adequate information and raising public awareness about the nature of disease is very crucial. This includes information on the risk of dissemination of infection; from animals to human and human to human. People need to be advised to avoid eating raw bush meat, avoiding direct contacts with symptomatic patients, practising safe burial methods, abstaining sexual contact with actively infected patient or wearing condom for male[24].

Another integral element in controlling the infection is contact tracing. These include identification, assessment and follow up of persons who may have encountered with infected individual[25, 26]. Rapid identification of symptoms is critical and prompt isolation of suspected individuals can ensure successful interruption of Ebola virus transmission and control size of epidemics.

As human mobilisation is one of the identified factors that contribute to the spread of infection to distant countries, appropriate travel advice is necessary. Strict travel bans to or from affected countries are not recommended, except for those who are suspected or confirmed EVD patients, and corpse of EVD patients[27]. It also potentially disrupts medical volunteerism, essential trades such as medical supplies, food, and fuel[28].

Thermal screening which detects febrile cases at departure or arrival at airport could be costly and not effective to detect all infected cases[29]. This is given that the risk for getting infection for travellers is low and it also could not detect afebrile patient within the incubation period[30].

In the second batch of test, the study aims to demonstrate EVD dynamics when there were efforts carried out to improve patients' survivals and reducing the death rate, as well as the importance of time management of outbreak. It signifies the need of fast action to control the spread of infection, and prompt institution of medical care so that the negative impacts can be minimized (Table 2).

Optimal medical care requires close monitoring, conscientious correction of fluid and electrolytes losses, as well as treatment of any superinfection, respiratory failure, nutrition support, pain and anxiety control, psychosocial support and treatment of any complication with the present of well-trained staff[31, 32].

However, supportive treatment in the form of correction of electrolytes can be challenging. Delays in getting laboratory result may hasten the disease complication and fatality. To

improve the situation, the use of rapid test kit for electrolytes such as i-STAT Hand-held Point of Care Analyser could be very helpful. It is handy to use, result can be produced within 20 minutes and has demonstrated accuracy and precision comparable to standard laboratory methods[33].

This research has limitation in terms of establishing causal relationship between influencing factors with epidemiological variables (rate of exposure, survival and death rate). In future, the model could be expanded to explore these factors such as study the influence of traditional burial methods, or latent phase of infection on exposure control.

CONCLUSION

This mathematical model has provided an insight on how EVD transmission might evolve throughout the outbreak. It shows that the reduction in exposure rate to infection has produced 'point of inflexion' especially when the exposure rate was reduced from 10% to 1%; it produced more than double improvement in the number of protected population and number of death. The result also has demonstrated the significant of efforts carried out to improve patients' survivals and the importance of time of intervention of the outbreak. Though EVD is highly fatal, the number of casualties can be minimized when the outbreak is controlled as early as possible. In conclusion, this study emphasized that to achieve optimum control of infection; it is going to require not only a successful vaccination program but also strategic implementation of preventive measures and rapid delivery of medical care.

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Original Article

Diamond Dialogue: A Tool to Explore Alcohol-related Harm and Strengthen Community Action

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ABSTRACT

The Diamond Dialogue has previously been used as a research tool, as a way of evaluating the effectiveness of development of interventions in changing quality of life in a variety of contexts. This paper aims to describe the development of the Diamond Dialogue as a community intervention tool to reduce alcohol-related harm. This was part of an action research study. Focus groups, using the Diamond Dialogue, were conducted during workshops to reduce alcohol-related harm in two different villages. The Diamond Dialogue was initially used as a tool to better understand how drinking was affecting their quality of life. The Diamond Dialogue was intentionally used as part of the intervention in one village, with the discussion on alcohol and quality of life leading into discussion on community level change to reduce alcohol-related harm. The discussion notes were analysed for themes related to quality of life and alcohol use. Alcohol was seen by community members to have both positive and negative effects on the community. Using the Diamond Dialogue as an intervention lead to greater levels of engagement, created a collective motivation to change and led to community level action planning. Exploring community ambivalence towards alcohol, acceptance of both the positive and negative effects and validation of the community's views provided a platform for engagement. This then lead to "change talk" about adopting low-risk drinking and ownership of possible solutions for alcohol related problems.

Keywords: community intervention, alcohol harm, Diamond Dialogue, alcohol harm reduction, empowering community, community level change

INTRODUCTION

Alcohol is one of the largest contributors to the burden of disease in the world, which results in around 2.5 million deaths each year; more than HIV, malaria, or death due to warfare. Malaysia is a Muslim country and has a relatively low per capita intake of alcohol at approximately 0.82 litre per capita[1]. This figure disguises the risky drinking practices among some subgroups, such as the ethnic Indians, Chinese and some of the ethnic groups in East Malaysia[2]. East Malaysia is geographically separated from the rest of Malaysia, on the island of Borneo and consists of two states: Sabah and Sarawak. They are culturally distinct from the rest of the Malaysian population and have large Christian populations. Alcohol is considered to be part of the culture of many of the ethnic groups in Sabah[3]. Barlocco described how alcohol acts as an identity marker for the Kadazan (one of the largest ethnic groups); "In the case of the Kadazan (and some other Kadazan-Dusun), alcohol consumption embodies the sense of being Kadazan"[4]. Discussing alcohol-related harm with a community where alcohol has become part of the cultural identity needs to be done with great sensitivity[5].

The Intervention Group for Alcohol Abuse was formed in 2009, with the broad aim of reducing alcohol-related harm in Sabah[6]. The members of the group were from diverse backgrounds, including clinicians, academics, Church leaders and individuals with a history of alcohol-related problems. The group trained

community leaders in recognising and helping people with alcohol-related problems and encouraging the formation of village level committees to address and minimize alcohol-related problems. This was largely successful, in that 16 out of 18 village committees formed ran a programme to reduce alcohol-related harm. These programmes included talks, workshops, alcohol-free activities and alcohol-related bylaws. Some of the village committees asked the project team to return to their communities to assist in running alcohol-related workshops. Two of these workshops were part of a small mixed-methods study to measure the effectiveness of the intervention programme and design better communication strategies. In previous community level workshops, we had used the format which is commonly used in Malaysian health promotion and included health talks, health screening and a lucky draw to encourage participation. Attempts to encourage active engagement initially had limited success, so we modified the format for this project, to specifically include more participatory elements.

The Diamond Dialogue was created as a research tool to measure the effectiveness of community level interventions on well-being[7]. This tool was initially used in this study as a way of evaluating the success of our alcohol intervention amongst communities with some participants with limited literacy and numeracy skills. While being used in this way, it was noted that the tool itself could provide an avenue for change. It has never previously been used specifically as an intervention in itself. This paper describes how the Diamond Dialogue was developed for use as an intervention tool to reduce alcohol-related harm at community level.

MATERIALS AND METHODS

This was part of an action research study, which had one of its aims to design and pilot test effective communication strategies with the community. In that process, the research method became an active part of the intervention. We trained research assistants from the villages in action research techniques. Two workshops were held in rural villages in October and November, 2014, with the aim of reducing alcohol-related harm. Members of both villages had previously attended our community leader training workshop and had requested help from the main committee in running the workshop. The community members who had attended the initial training workshop had felt that alcohol was part of the life of the village, but also caused harm.

In both workshops talks and small group discussions were held, which aimed to create community level plans to reduce alcohol-related harm. The first workshop started with talks, followed by discussion. The second workshop started with discussion. In both workshops, the Diamond Dialogue technique was used. In the first workshop, this was done near the end of the workshop, and the purpose was only to collect baseline data for the intervention study. In the second workshop, this was done near the beginning and was used as an integral part of the small group discussion to create community level plans to reduce harm. The groups were divided by gender, with approximately 10 per group. The female groups were led by female facilitators and one of the men's groups was led by a female facilitator and one by a male facilitator. A large paper with a diamond was given to the participants (Figure 1 and Figure 2). Participants were asked four different questions: "What does happiness mean to you?", "What does unhappiness mean to you?", "What makes you happy?", "What makes you unhappy?". They were given the instruction: "Between the extremes of 'Very happy' and 'Very unhappy', where do you place your current level of happiness?" In the second workshop, participants were then led into a discussion on the role alcohol played in this and how the happiness level of the community could be increased. This then led into discussion about community level plans to reduce alcohol-related harm. In the first workshop, the discussion about community level plans had preceded the

Diamond Dialogue, so the Diamond Dialogue had not been used to help create the plans.

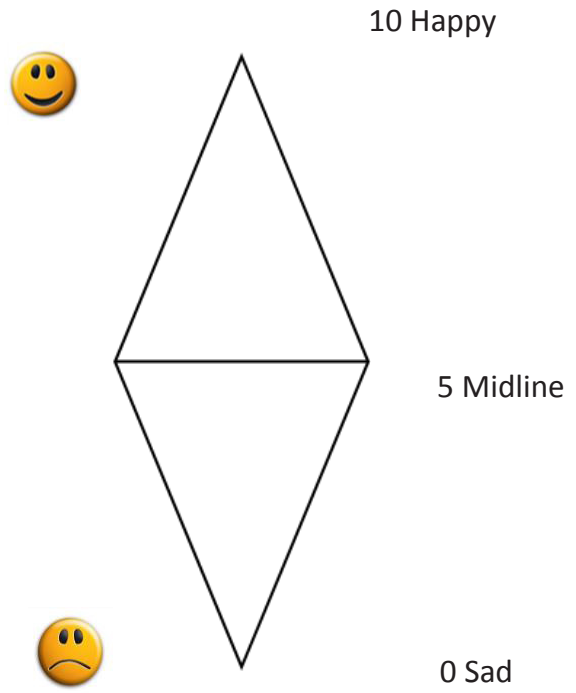

Figure 1 Diamond with categories

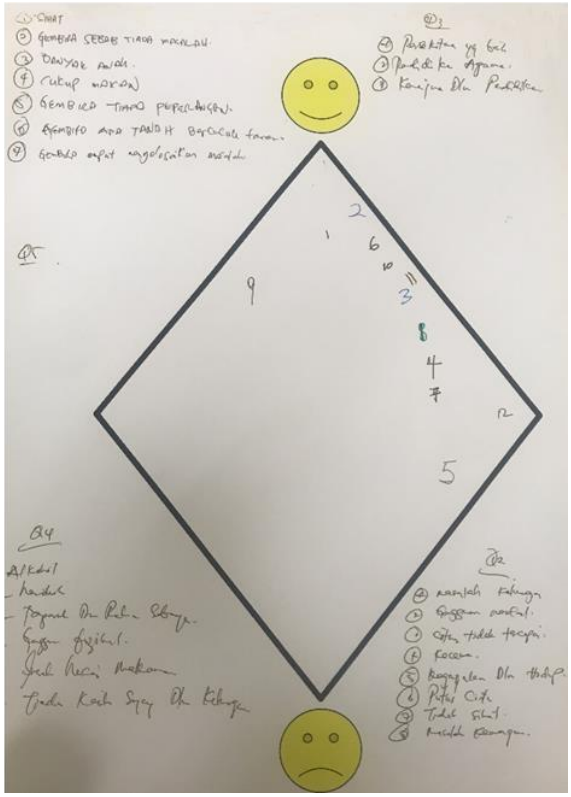

Figure 2 Example of Diamond Dialogue

The sessions were not recorded because we did not want to inhibit responses in this initial stage. Notes were taken by the facilitators in response to the questions. A thematic analysis of the responses was conducted, using a 'bottom-up' inductive approach[8]. The position on the diamond shape was analysed by overlaying an 11-point grid based on the Personal Well-being Index (PWI)[9], 10 corresponded to the highest level of happiness and 0 corresponded to the lowest level of happiness. Written consent was obtained at the initial stage of the project, which included both quantitative and qualitative components. Prior to the focus group, oral consent was used to confirm that they still wanted to be involved in the project. The project was given ethical approval by the Ethics Committee at Universiti Malaysia Sabah (JKEtika2/12(1)).

RESULTS

In the first workshop, talks about alcohol were held, followed by a small group discussion. It was difficult to start the conversation about alcohol use in some of the male groups, who were hesitant to engage with the team. During these groups the participants were asked why (without asking if) they wanted to change the alcohol-related culture in their village and how this might be done. It became apparent that participants believed that there were positive effects of alcohol in the community and on their quality of life. For example, one of the male groups clearly expressed that they did not want to change the alcohol culture because there were few other things to do in the village. The women's group and children's group were more open in talking about alcohol-related harm in their village, particularly in relation to relationship difficulties and domestic violence.

The second workshop started with the small group discussion using the Diamond Dialogue. The themes discussed are described to illustrate how this lead to discussion about community level change to reduce alcohol-related harm. Five main themes were found in answer to the questions about what makes people happy

and unhappy. These were named: Family and relationships, Security, Health, Expanding horizons and Religion; which overlap partially with the eight domains of the PWI. Alcohol was a topic that pervaded all of these themes, with positive and negative effects being recognized by participants.

Family and Relationships

This was the first theme that emerged in most groups and appeared to be the most important. People generally expressed satisfaction in their relationships. Family relationships were mentioned most frequently, with relationships with others mentioned very little. Children were a source of both happiness and unhappiness, with people expressing dissatisfaction with children not listening to them or arguing with each other. Grandchildren appeared to only be a source of happiness, not unhappiness. Some of the male participants mentioned that they were happy because they did not have children.

Alcohol was also mentioned in both positive and negative light in this category. People talked about alcohol improving social connectedness and social events, making them more outgoing generally. One of the women's groups talked about the husband drinking too much being a source of unhappiness including fighting and domestic violence. One of the male groups talked about alcohol breaking up families.

Security

Financial, physical, environmental and role security were part of what it meant to be happy. Having no debt, home ownership, a safe environment, adequate resources and being free from external threats were a source of happiness. They saw unemployment, having debts, poverty, inadequate food, a broken down car, less facilities, floods and accidents as being sources of unhappiness. They were worried about the future security of their children, and who would care for them if they got sick or died. Alcohol was seen as part of the culture and the men's group implied that modern health promotion (including the alcohol harm reduction event that was being run that day) was a threat to their cultural security. The women's group talked about how the cost of alcohol was impacting on the money available for their children's education. The women discussed their frustration about the men not being able to do anything when they are drinking and compromising their economic security through loss of wages and wasted resources.

Health

Health was seen as essential to happiness, for both themselves and their children. This theme mainly emerged when talking about reasons for unhappiness, rather than reasons for happiness, implying that it is something that is taken for granted by the people who were healthy.

They believed alcohol was both a source of poor health and good health. Some of the men described alcohol use as being a successful coping mechanism, which helped them to deal with problems. The women talked about concern about the men's drinking leading to health problems and the men were worried about overuse leading to hangovers.

Flourishing (Expanding Horizons and Having Fun)

This category emerged as being different, in that it was not about maintaining what had already been attained, but about developing new aspirations and experiencing the joy of life. This included success in school, business and work. Travel, socialising with friends, meeting new girlfriends and voluntary work were also discussed. One group also discussed empowerment, in that they were able to solve their own problems.

Alcohol was again seen as a positive and a negative in this category. Both male groups believed that alcohol was very much a part of having fun and social events without alcohol

were seen as dull. One male group expressed that alcohol was a key ingredient in their quality of life, in that there life would be very dull without it. The male group also acknowledged that alcohol could impair their aspirations if used excessively.

Religion

Religion was a key source of happiness for both male and female participants. They described praying and going to church as contributing to their happiness. They did not mention religion as part of their unhappiness. They did not mention religion in relationship to alcohol. The participants in the focus groups were all Christians.

Positioning on the Diamond Dialogue

The range of values on the Diamond Dialogue was between 10 and 3.8 with a mean of 6, which is slightly less than the average for most countries on the PWI[7]. In two of the groups there was a variety of responses, and in the other two groups most of the responses were clustered around the midline, meaning neither happy nor sad. The mean scores for the female groups were 5.3 and 5.8 and for the male groups 5.7 and 7.1. These findings need to be placed in the context of cross-cultural research on differential attitudes to expressing happiness and satisfaction which points to clear patterns of cultural bias[10, 11]. The set points which individuals use to evaluate their lives tend to be much lower in the Asian context than in Western countries because of philosophical, cultural and religious traditions which discourage expression of exhilaration and exuberance in favour of contentment and harmony. Furthermore, standard deviation of results also tends to be lower as it is also not acceptable to express too much sorrow and dissatisfaction. Thus respondents tend to 'head for the middle ground'[11].

Therapeutic Effect

The Diamond Dialogue acted as an icebreaker in the workshop, allowing participants to express themselves openly and creatively. The initial defensiveness towards the perceived mission of the project changed during the Diamond Dialogue session, when the participants realised that this was not a prohibition exercise and that their beliefs about the positive aspects of drinking were acknowledged and accepted. The facilitators reported a difference compared to previous workshops, which had started off with talks and were more didactic. During the workshops where the Diamond Dialogue had been used, the participants also stayed until the end of the five-hour workshop and were enthusiastic until the end. After the Diamond Dialogue, the participants were taking part in discussion and asking questions during presentations. At the end of workshops, participants were normally asked what they would like to do to change the drinking culture of their village. In previous workshops, only a minority of people took part in this discussion. This workshop was noticeably different in that most of the people present were actively involved in discussion and many more ideas were generated. These ideas focused on the ways to reduce the harm related to alcohol, rather than stopping people drinking altogether. The previous discussion regarding both the positive and negative effects of drinking lead participants to conclude that the amount that the community was drinking needed to be reduced. Drinking in small amounts lead to the positive effects, but drinking in large amounts was what leads to the negative effects. This then prompted discussion on ways to encourage community members to drink in reduced amounts. After finding the technique was useful in this workshop, it has been used in subsequent workshops, with similar outcomes.

DISCUSSION

The Diamond Dialogue started a conversation about quality of life and the importance of alcohol in the villages in which it was used. These conversations were notably more open than the conversations that we had previously

attempted to start. Alcohol was seen as something that could both improve or reduce quality of life, depending on how it was used. In using the Diamond Dialogue as a research tool, we discovered that it was useful as a tool to explore the collective ambivalence about the role of alcohol in the community. The explorations of this ambivalence lead to collective decision making regarding change in the community as a whole. Part of this decision making was discussion about ways to change the community in line with harm reduction.

What was done at a collective level is parallel to what is done in motivational interviewing at an individual level. In motivational interviewing, ambivalence is actively explored and positive and negative views about substances are accepted. The therapist adopts a neutral stance, and accepts that there may be positive effects of the substance on the client's life. In our workshops, both the positive and negative effects on quality of life in the community needed to be accepted, before any discussion about alcohol-related harm could take place. The participants in this study talked about alcohol having both positive and negative effects on most dimensions of their well-being. This is not normally acknowledged in health promotion efforts in Malaysia, which tend to focus on harm. In this workshop, ambivalence was accepted as normal and was worked with. Prochaska and Diclemente (1983)[12] discussed the stages of change that individuals pass through, including pre-contemplation, contemplation, ready for action and maintenance. In the workshops where the Diamond Dialogue was used, the groups could be seen as collectively moving from the pre-contemplation/ contemplation stages to the ready for the action stage (community action).

In health promotion theory and practice there is a tension between (1) 'healthy lifestyle' approaches that aim to persuade individuals to change their health-related behaviour and (2) 'social determinants' approaches that aim to create healthier environments through systemic strategies, rather than encouraging individual change. The first approach is criticised for essentially 'blaming the victim', whereas the second approach can be criticised for being top-down and disempowering, since it disregards individual agency. The Diamond Dialogue approach is a 'healthy environment' approach, in that the social environment changes. However, agency is not removed. Significant numbers of individuals in the community are involved in decision making. Using the Diamond Dialogue in this way shifts the agency from the individual to the community. The decision for community action is made by a collective consciousness, rather than individuals. This decision then leads to a change in the social environment of the community as a whole. Gillies (1998)[13] reviewed community partnership initiatives in health promotion and concluded that genuine community engagement is difficult and frequently only involves people at the top of social hierarchy. Clarifying community values and making a decision together enhances social capital.

The enduring basic principles of health promotion are similar to the core principles of these individual therapies. Collaboration, equality, finding common ground and setting common goals have always been[14], and continue to be[15], considered key ingredients in ensuring successful health promotion. In addition, The Shanghai Declaration (WHO, 2016)[15] reiterates the sentiments of the Ottawa Charter (WHO, 1986) by emphasizing that 'empowering people to increase control over their health and ensuring people-centred health systems' is the only path to sustained health and well-being. However many community interventions are similar to the first workshop we conducted, in that direct confrontation and specific focus on harms is used. This is likely to lead to the same effects as when direct confrontation is used in individual therapy. Studies have shown that therapists that get into conflict with clients have less favourable outcomes[16]. If direct confrontation is used, clients tend to defend their current position and resistance to change increases, which is what we noticed in the first community based workshop. In motivational interviewing,

the therapist avoids any argumentation with the client, but accepts the client's point of view and "roles with resistance"[17].

Strengths and Weaknesses

This is a preliminary report on a new intervention for communities, discovered while using the tool as a research technique. This study was not designed to specifically look at the effectiveness of this intervention and further research is required to do this.

CONCLUSION

Despite knowledge of factors that are important to health promotion, there are few practical techniques that will lead to motivation to change at a community level. The Diamond Dialogue technique is promising, with this project showing that ambivalence can be explored, change talk and action elicited and common goals set in terms of reducing alcohol related harm. It enhances health literacy which 'empowers individual citizens and enables their engagement in collective health promotion action' (WHO, 2016:1). Further study and research is needed to explore whether this technique is more effective than traditional techniques of health promotion.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests in publishing this paper.

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Original Article

Need Domains of Family Members of Critically-ill Patients: A Borneo Perspective

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ABSTRACT

The needs of family members of patients have often been neglected. Many investigations have presented that meeting the needs of families and helping them cope with the period of hospitalization will improve the well-being of relatives of patients admitted to the Intensive Care Unit (ICU). The aim of this study was to identify the needs of family members of patients admitted to the ICU at Queen Elizabeth Hospital, Kota Kinabalu, Sabah. This cross-sectional study recruited 60 family members, and a validated Critical Care Family Needs Inventory in Bahasa Malaysia was used to verify the needs of these families. The outcomes disclosed that family members ranked "assurance" as their utmost need. "support" was ranked the least important. The differences in mean values of gender, education level, history of admission and types of relationships among the family members were trivial. The results of this research will help us prepare guidelines to educate ICU healthcare providers, as well as information pamphlets for the relatives of admitted patients.

Keywords: critical care, family members, Intensive Care Unit, assurance

INTRODUCTION

Critical and haemodynamically unstable patients are admitted to the Intensive Care Unit (ICU). In ICU, they will be monitored and supported until they recover which may take between days to weeks of admission. According to the Malaysian Registry of Intensive Care Unit (ICU), there was an increase of 33% in ICU admissions over the past five years since 2011[1]. Admission to the ICU can cause unimaginable stress, both to the patient, as well as their family members. This stressors manifest in many ways, and may likely affect the family member's quality of life.

In the past, critical care management was only focused to handle the admitted patients, while the family members were usually ignored. However, in the last few decades, the holistic approach of caring for the needs of family members accompanying the critically-ill patient was constantly highlighted. One of the research pioneers to look into the needs of relatives of critically-ill patients was Molter in 1979[2]. This study showed that relatives of critically-ill patients do have crucial needs, and fulfilling those needs is important for their well-being.

Other studies continued to prove that a hospitalization in the ICU can be a very devastating event for the family of critically unstable patient. Family members are vulnerable to anxiety and helplessness, particularly if their own needs are not met[3]. In one study, symptoms of anxiety and depression among family members of critically-ill patients were as high as 58% and 26% respectively[4].

ICU doctors and nurses are often likely to ignore the pertinent needs of family members of ICU patients in daily hectic and occupied routine works[5]. Some ICU personnel do not provide sufficient and detailed information on the patient's ever-changing condition and prognosis[6]. This may snowball to cause a bigger problem. In Sabah, we are lacking study to look into the vital important needs of families of ICU patients. Therefore, there were no guidelines to help them. This study was aimed to expose and highlight the needs of family members accompanying ICU patients.

MATERIALS AND METHODS

This study was a descriptive, cross-sectional research design using a validated Malay language questionnaire. An overall of 60 family members of ICU patients whose had been staying at least three days in HQE were included into the study in between April 2017 to June 2017. The ethical approval was obtained from the hospital Ethical Committee. All participants had signed their consent forms in Bahasa Malaysia before the commencement of study. The participants' details were kept confidential and no identity of participants was used in the questionnaire.

The Critical Care Family Needs Inventory (CCFNI) was used for this study[2]. The original CCFNI was a 45-item inventory. This instrument comprised of five domains, with each domain measuring different needs among families: assurance (necessity for hope in the favourable results), information (necessity for prompt information on patients' illness condition), proximity (necessity to be remained close with the ill family member), comfort (individual well-being and comfort), and support (includes resources, support systems or structures)[7]. Our study questionnaires CCFNI have been well verified and have excellent internal consistency values as well as good psychometric properties. The Malay version of CCFNI (henceforth, CCFNI-M) has been checked through a series of factor analyses in the validation protocols to conclude a total of 42 out of 45 items in CCFNI Malay Version. The internal consistency of the CCFNI-M was good ($\alpha = 0.93$) in coherent with each Cronbach's alpha values of the five domains in CCFNI Malay Version which was ranged between 0.72 and 0.81[8].

All the items in CCFNI-M have adapted a Likert scale format using number 1 until 4, with 1 being least important and 4 being most important which indicates that the scores reflect the level of that particular need proportionately among those respondents who completed the CCFNI.

All the data collection from distributed questionnaires to family members was processed and analysed using IBM Statistical Package of Social Sciences (SPSS) version 22.0. Descriptive and inferential statistics were used to determine any difference between groups analysis the needs of family members of ICU patients.

RESULTS

Demographic Characteristics

There were 43.3% (26) and 56.7% (34) of male and female participants respectively. The overall mean age was 38.45 (SD = 11.3) years. The demographic analysis showed that 35% (21) were parents, 28.3% (17) were siblings, 13.3% (8) were spouses, 6.7% (4) were children and 16.7% (10) were other relatives. A majority (56.7%) of the respondents had obtained higher secondary school education, 21.7% had lower secondary school education, and only 20% had bachelor degree education (Table 1).

Table 1 Socio-demographic profile of patient's caregivers (n = 60)

Socio-demographic profile	*n* (%)
Gender	
Male	26 (43.3)
Female	34 (56.7)
Respondent-patient relationship	
Spousal	8 (13.3)
Children	4 (6.7)
Parents	21 (35)
Siblings	17 (28.3)
Relatives	10 (16.7)
Educational status	
Bachelor degree	12 (20.0)
Higher secondary	34 (56.7)
Lower secondary	13 (21.7)
Primary and below	1 (1.6)
History of admission	
Yes	31 (51.7)
No	29 (48.3)

The Needs of Family Members of ICU Patients

Table 2 shows the list of mean values list of all items of CCFNI Malay Version in descending order. The mean values (M) ranged between 3.82 and 2.50. Family members accompanying ICU patients perceived item "to be assured that the best care possible is being given to the patient" as most crucial assurance which attained the highest remark with mean value 3.82, SD = 0.39. ICU patients' information that was perceived as a priority and imperative by family members were the item "to know the expected outcome" (M = 3.70, SD = 0.50) and item "to know exactly what is being done for the patient" (M = 3.63, SD = 0.49). The least priority perceived by family members were the item "to be told about other people that could help with problems" with score M = 2.61, SD = 0.88 and the item "to feel it is alright to cry when I want to" with score M = 2.50, SD = 0.89. The assurance and information domain items obtained the highest scores while the support domain items received the least scores.

Table 2 Rank of items identified by patient's family members

Rank	Dimension		Mean	±SD
1	Assurance	*To be assured that the best care possible is being given to the patient.*	3.82	0.39
2	Assurance	*To know the expected outcome.*	3.70	0.50
3	Information	*To know exactly what is being done for the patient.*	3.63	0.49
4	Information	*To know how the patient is being treated medically.*	3.62	0.52
5	Assurance	*To feel that the hospital personnel care about the patient.*	3.58	0.62
6	Assurance	*To have questions answered honestly*	3.58	0.62
7	Assurance	*To be called at home about changes in the patient's condition*	3.57	0.56
8	Assurance	*To know specific facts concerning the patient's progress*	3.55	0.70
9	Information	*To know why things were done for the patient.*	3.55	0.67
10	Information	*To talk about the possibility of the patient's death*	3.53	0.81
11	Assurance	*To talk to the doctor every day*	3.52	0.62
12	Assurance	*To receive information about the patient at least once a day.*	3.48	0.62
13	Assurance	*To have explanations given that are understandable*	3.47	0.75
14	Proximity	*To have the waiting room near the patient.*	3.42	0.87
15	Information	*To know which staff members could give what type of information*	3.38	0.78
16	Assurance	*To help with the patient's physical care.*	3.35	0.73
17	Proximity	*To have good food available in the hospital.*	3.35	0.73
18	Information	*To know about the types of staff members taking care of the patient.*	3.32	0.75
19	Assurance	*To have a specific person to call at the hospital when unable to visit.*	3.30	0.72
20	Proximity	*To see the patient frequently.*	3.28	0.78
21	Support	*To have another person with me when visiting the critical care unit.*	3.27	0.76
22	Assurance	*To have explanations of the environment before going into the critical care unit.*	3.27	0.73
23	Comfort	*To talk about feelings about what has happened.*	3.23	0.70
24	Comfort	*To feel accepted by the hospital staff.*	3.23	0.85
25	Support	*To have directions as to what to do at the bedside*	3.20	0.82
26	Support	*To have friends nearby for support*	3.18	0.89
27	Proximity	*To visit at any time*	3.10	0.88
28	Comfort	*To have visiting hours changed for special conditions*	3.08	0.87
29	Comfort	*To have a place to be alone while in the hospital*	3.05	0.83
30	Support	*To have someone be concerned with my health.*	3.03	0.82
31	Support	*To be assured it is alright to leave the hospital for awhile*	3.02	0.83
32	Support	*To be told about someone to help with family problems*	3.00	0.80
33	Comfort	*To have comfortable furniture in the waiting room.*	2.97	0.97
34	Proximity	*To have a telephone near the waiting room*	2.95	0.95
35	Support	*To have someone to help with financial problems*	2.92	0.89
36	Proximity	*To talk to the same nurse every day.*	2.88	0.98
37	Proximity	*To have a bathroom near the waiting room.*	2.87	0.91
38	Support	*To be told about chaplain services*	2.83	0.96
39	Support	*To have a pastor visit*	2.80	0.95
40	Support	*To be alone whenever I want*	2.72	0.96
41	Support	*To be told about other people that could help with problems*	2.61	0.88
42	Support	*To feel it is alright to cry when I want to.*	2.50	0.89

In the descriptive statistical analysis, we could appreciate that Assurance scored the highest score (M = 3.53, SD = 0.38) and Information (M = 3.51, SD = 0.50) scored the second highest on the list as shown in Table 3. In spite of current unfavourable economy constraints on the population in Sabah State, Support in term of financial support, hospital facilities and other available non-governmental resources obtained the lowest scores with mean value = 2.92 (SD = 0.54).

Table 3 Descriptive profiles of CCFNI-M domain

Dimension	Minimum	Maximum	Mean	SD
Assurance	27.00	44.00	3.53	0.38
Information	12.00	24.00	3.51	0.50
Comfort	7.00	24.00	3.14	0.56
Proximity	11.00	28.00	3.12	0.58
Support	19.00	48.00	2.92	0.54

Correlations between the Age of Family Member and 5 Domains in CCFNI-M

We use a Pearson correlation test to assess any associations among these 5 domains of CCFNI. The statistical analysis discovered a strong positive correlation between different domains as illustrated in Table 4. The 3 strongest correlation values were distinguished in Support-Proximity pair (r (58) = 0.85, p < 0.001), Information-Assurance pair (r (58) = 0.82, p < 0.001) and Comfort-Proximity pair (r (58) = 0.75, p < 0.001). The weakest correlation value was demonstrated in Information-Comfort pair in which a reasonable positive correlation was shown in Table 4 (r (58) = 0.52, p < 0.001).

Table 4 Pearson correlation coefficients between CCFNI-M dimensions and age

Measures	(1)	(2)	(3)	(4)	(5)	(6)
(1) Assurance	1.00	0.66*	0.60*	0.82*	0.60*	0.28
(2) Proximity		1.00	0.75*	0.54*	0.85*	0.12
(3) Comfort			1.00	0.52*	0.72*	−0.02
(4) Information				1.00	0.60*	−0.06
(5) Support					1.00	−0.04
(6) Age						1.00

*Significant p value (p < 0.001)

Correlations between Demographic Profiles and CCFNI

We use the independent t-test and one-way ANOVA to retrieve any mean differences in CCFNI-M dimensions across demographic profiles of all the respondents. There was no any substantial outcome on needs of family members, the gender of family members, history of ICU patient admission and level of education among the family members.

DISCUSSION

This is one of the pioneer research paper focused on the family needs in ICU among Malaysian population using validated CCFNI-M. The first study was done in West Malaysia. This single-centre cross-sectional study was conducted in Hospital Queen Elizabeth, Sabah. It clearly indicated that assurance is the most vital and crucial needs among family members accompanying patients in ICU. The findings are in conjunction with previous single and multi-centred researches in West European and Asian countries[10 – 13].

During an ICU admission, patient's relatives and close ones may become anxious and experience emotional distress. Thus, it was a period of great disturbance, confusion, and uncertainty faced by all families of ICU patients. These families need an assurance from those who were managing the patient's condition[14]. Assurance is of high-priority and significantly important component among all the needs as it could help to lessen the tremendous uncertainty and stress of immediate members accompanying the ICU patients. This raised a concern when reassurance would lead to an overwhelming expectation for a positive outcome and later on denial and feeling very shock for a negative outcome[15, 16]. Being professional and truthful is still our utmost priority.

Nelson et al. highlighted the importance of the communication needs of healthcare providers and family members[17]. Successful information transfer involves both conveying medical information to non-medical personnel such as the relatives and family members who have little background of medical knowledge and also those who are enthusiastic about internet online medical information. The item "lack of information about the patients' status" and "lack of explanations of the medical equipment being used in intensive care units" represented 2 different aspects of information gap between the ICU staffs and the family members[18]. Similarly, our study showed that family members are keen to get information regarding the exact care given and explanation about the procedures done to the patient. Therefore, health care providers should give importance to spending time with the families to give proper explanation regarding treatment and procedures to their loved ones.

However, our study showed that family members have ranked support as the least needed domain. It reflects that family members have less emphasis on their physical and personal needs. Research has shown that traditionally some families have placed their personal comfort needs less important, preferring more focus and care to be given to their suffering loved one[19]. Therefore, it is important to note that this does not mean healthcare providers should ignore giving support to them[20]. Our study also showed proximity and comfort as not a priority to them. This could be explained as the relatives wanted the ICU staff to remain focus on the health condition of the patient.

Limitations of the Study

This research has a small sample size. The inclusion criteria were family members of patients admitted more than 3 days in ICU. However, 3 days period at ICU can influence family members' opinion and satisfaction over ICU staff services. We are planning a post discharge ICU study that would prove to be a practical tool for comparison of needs after transferred out from the ICU.

CONCLUSION

The needs of relatives of the critically-ill patients must never be underestimated. These needs, if not addressed well, may pose a significant negative effect in their life. Our study has identified assurance as an important need. Therefore, we will address this need in a planned and coordinated manner. Guidelines to educate ICU healthcare providers, as well as information pamphlets for the relatives of admitted patients should be made available in the near future.

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Case Report

Placental Histopathological Examination in Foetal Sepsis

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ABSTRACT

Intrauterine infection has emerged to be the main and frequent cause of premature delivery and foetal demise. Microorganisms gain entry into the amniotic cavity via ascending route, haematogenous dissemination, retrograde seeding from peritoneal cavity and accidental introduction during invasive procedures. This is a case of foetal loss in utero from a twin pregnancy due to intrauterine sepsis diagnosed through placenta examination. Both maternal and foetal evidences of inflammatory response were demonstrated in the placenta on histology. Microscopically, there were acute chorioamnionitis and villitis as well as abundant gram positive cocci in the foetal blood within placental villous capillaries. The presence of intravascular bacterial organism provides evidence for a conclusive diagnosis of intrauterine sepsis, particularly where the placenta or foetal blood microbiological cultures results are not available or equivocal. More attention should therefore be given when sampling, as pathological evidences of underlying foetal compromise or death could be provided by well-represented placental tissue samples.

Keywords: foetal loss, intrauterine sepsis, villitis, chorioamnionitis

INTRODUCTION

Intrauterine infection has emerged to be the main and frequent cause of premature delivery and foetal demise. Microorganisms enter into the amniotic cavity via ascending route, haematogenous dissemination, retrograde seeding from peritoneal cavity as well as accidental introduction during invasive procedures[1, 2]. More often microbiological laboratory investigations are being done on the suspected cases to determine the causative microorganism. However, as an additional investigation, placenta histopathological evaluation on well-represented samples could be helpful in understanding and ascertaining the cause of foetal death which will be of value in the management of future pregnancies. We present a case of intrauterine sepsis with foetal loss diagnosed through placenta examination.

CASE PRESENTATION

A 31-year-old lady, G2P1 with a twin pregnancy at 20 weeks and one day of gestation presented to the emergency department with one day history of leaking liquor and low grade fever. She also gave a history of previous mild episode of per vaginal bleeding at 2 months of gestation and was prescribed a hormonal medication. The bleeding ceased subsequently and she had stopped taking the medication 2 weeks later. However, she started to have vaginal spotting for the past 3 days prior to admission. There was no history of trauma or abdominal pain. Foetal scan showed growth parameters appropriate for gestational age in both twins and the placenta was monochorionic and diamniotic. Her first child was born four years ago by caesarean section due to poor progress of labour. The previous pregnancy was complicated by late onset pregnancy induced hypertension requiring antihypertensive during labour. The daughter is alive and in good health. On physical examination

her pulse rate was 120 beats per minute and blood pressure was 130/80 mmHg. Both foetal heart beats were detected. Her liquor was clear and the membrane was ruptured. Laboratory investigations showed elevated white cell count (17.75×10^9/L), predominantly of neutrophils. However subsequently in the ward, she developed chills and rigors with temperature of 38.5°C. The twins were spontaneously delivered at 20 weeks and 4 days of gestation with no sign of life. The liquor was foul-smelling.

Microscopic examination of the placentas showed acute chorioamnionitis and funisitis. There were acute villitis (Figures 1a and 1b) with abundant neutrophils within the intervillous spaces of the placenta. Numerous bacterial colonies were present within the foetal villous capillaries (Figures 2a and 2b) in both placentas which were shown to be gram positive cocci. Group B *Streptococcus* was isolated from high vaginal swab and *E.coli* from maternal blood culture. She was treated with parenteral ampicillin and metronidazole.

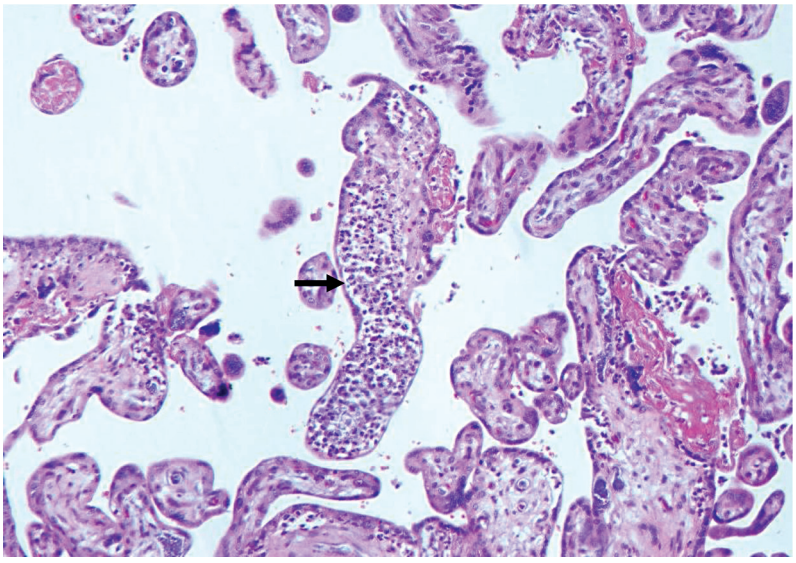

Figure 1a Photomicrograph: Architecture of placental villous tissue. The arrow indicates acute villitis. (Haematoxylin and Eosin stain, ×100 magnification)

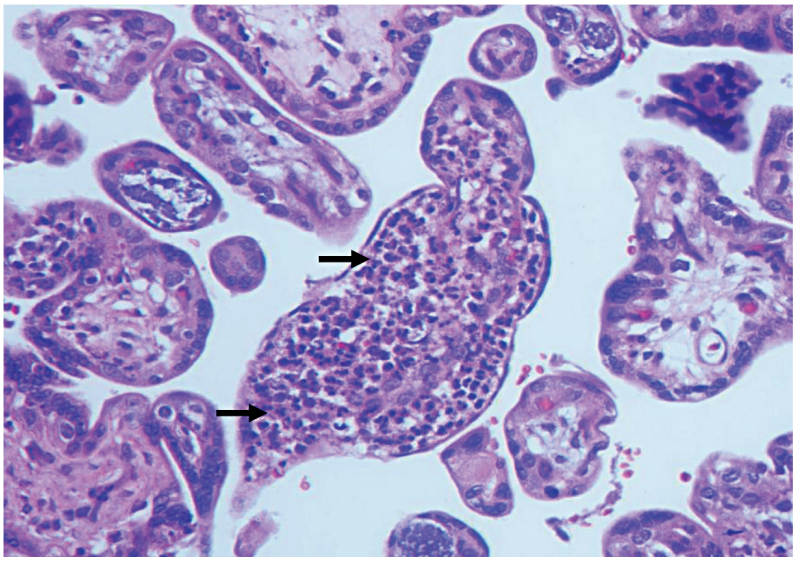

Figure 1b Photomicrograph: Architecture of placental villous tissue. The arrows indicate dense intravillous neutrophils infiltrates. (Haematoxylin and Eosin stain, ×200 magnification)

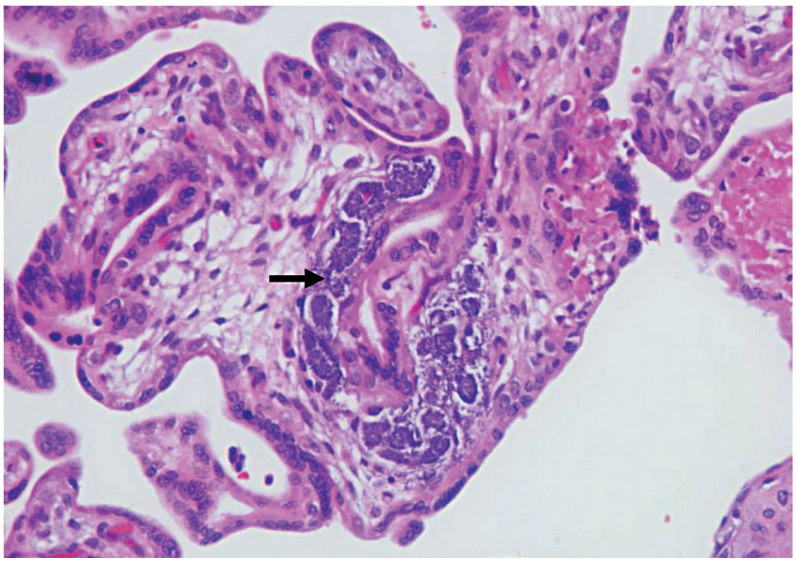

Figure 2a Photomicrograph showing placental villi with intravascular bacterial organism within the foetal villous capillaries as indicated by the arrow. (Haematoxylin and Eosin stain, ×200 magnification)

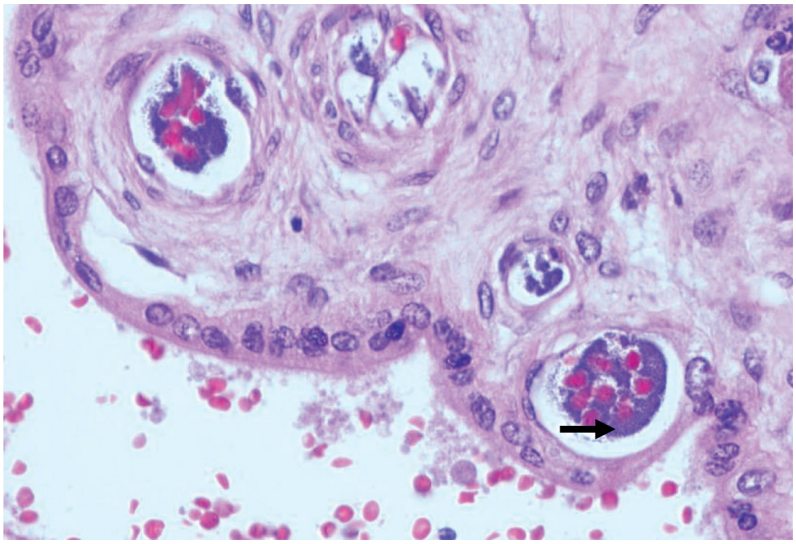

Figure 2b Photomicrograph showing foetal villous capillaries with presence of intravascular bacterial organism as indicated by the arrow. (Haematoxylin and Eosin stain, ×400 magnification)

DISCUSSION

Infection is a well-recognized cause of spontaneous miscarriages and perinatal mortality. The placenta and amniotic membrane are the two important structures preventing the access of organisms to the foetus[1]. A breach in these barriers may lead to amniotic and intrauterine infection. Prematurity, foetal or neonatal sepsis and other related perinatal morbidity are some of the known complications associated with intrauterine infection.

The most common route of intrauterine infection is through ascending infection from the cervicovaginal flora[2]. Microorganisms may also be transmitted to the foetus by haematogenous dissemination, retrograde seeding from peritoneal cavity as well as accidental introduction during invasive procedures[1, 2]. Almost 40% of all premature births are due to intrauterine infection and chorioamnionitis[3]. However, many of the mothers with intrauterine infection are asymptomatic.

Acute chorioamnionitis is an acute inflammatory reaction characterized by presence of neutrophils infiltrates. It usually starts at the point of membrane rupture where it is first exposed to the pathogenic organisms[3]. The other parts of placenta tissue which include chorionic plate, subchorionic space as well as the umbilical cord are also involved depending on the progression of the inflammatory response. Acute chorioamnionitis on histopathology demonstrates evidence of both maternal as well as foetal inflammatory responses[1, 4]. The neutrophils originate from two sources; maternal and foetal. Neutrophil infiltrates in the foetal membrane, subchorionic intervillous spaces and in the maternal blood vessels of deciduas are of maternal origin, while neutrophils seen within the umbilical cord or in the chorionic plate vessels are of foetal origin[4]. The emigration of neutrophils is often in the direction towards the source of infection in the amniotic cavity[1, 4]. In the umbilical cord, neutrophilic emigration takes place in the umbilical vein before the arteries, towards the amniotic surface (funisitis)[4]. The presence of funisitis and inflammation in the foetal vessels signify that the foetus has mounted an immune response[1]. In maternal inflammatory response, the neutrophils migrate from the maternal blood vessels into the deciduas. The resulting deciduitis and decidual bleeding often manifest clinically as vaginal bleeding followed by rupture of membranes[1, 5].

The most significant and important complication of ascending amniotic infection is foetal infection. Aspiration of infected amniotic fluid may cause intrauterine pneumonitis[4]. Foetal sepsis and meningitis are other common sequelae observed during perinatal period[6]. It is reported that 23.5% of chorioamnionitis was detected histopathologically in those with negative amniotic fluid culture[7]. Thus, histopathological evaluation of placental tissue is important and would be helpful in suspected chorioamnionitis with negative culture results[8]. This would capture those cases with subclinical or 'silent' acute chorioamnionitis.

Intrauterine infections are associated with a selected group of high virulence infecting organisms, such as Group B *Streptococcus* (GBS), *Escherichia coli*, *Ureaplasma* sp., *Fusobacterium* sp. and anaerobes[9]. When significantly high quantities of these organisms are present, an inflammatory response will be elicited leading to systemic signs of infection. When maternal and/or neonatal bacteremia complicates intrauterine infection, the two organisms most commonly isolated are the group B *Streptococcus* (GBS) and *Escherichia coli*[9]. These microorganisms are found colonized in the maternal genitourinary tract. Both are important leading causes of neonatal sepsis[3].

GBS commonly causes asymptomatic bacteriuria in pregnant women[6]. Neonates born to colonized mothers are at risk of developing GBS disease. Ascending intrauterine infection usually gives rise to early-onset invasive GBS disease, sometimes resulting in foetal demise[3]. This is in contrast to much later onset of disease when the exposure to GBS is acquired at birth. Microscopic findings of acute villitis and the presence of large colonies of GBS bacteria within the foetal villous capillaries indicate an underlying foetal sepsis[3]. Amongst the gram negative bacilli, *E.coli* is also an important cause of neonatal sepsis. In this case the underlying maternal *E.coli* bacteraemia could have increased the risk of invasive intrauterine GBS infection as demonstrated in the histopathological findings.

The entry of microorganisms into the amniotic cavity is associated with high concentrations of pro-inflammatory cytokines in the amniotic fluid. Examples of the cytokines are interleukin-1, tumour necrosis factor, interleukin-6, interlukin-8 and a gelatinase, matrix metalloproteinase-9[10]. It was also found that funisitis and chorionic vasculitis are associated with elevated foetal blood level of interleukin-6[11]. Current researchers are focusing on the effects of these elevated cytokines on foetal tissue and infant morbidity[4]. Some studies emphasized on the associations of elevated cytokines with cerebral palsy, asthma and autism[12, 13].

Routinely, a positive foetal blood culture result is required to confirm the diagnosis of intrauterine sepsis as the cause of foetal demise. In this case, both maternal and foetal evidences of inflammatory response were demonstrated on placenta histology. The demonstration of gram positive cocci through placenta examination provided a definitive evidence of underlying intrauterine sepsis, although placenta and foetal blood culture were not available or inconlusive[14].

Placenta is an invaluable source of information and its histological evaluation is of equal importance to other ancillary investigations. This is especially so when it concerns intrauterine death of a foetus. For Muslim mothers, adequate tissues sampling are necessary before the placenta is returned to them for burial purposes. This is to ensure that all lesions are being represented for determining a more definite underlying cause of foetal compromise or demise.

CONCLUSION

This case illustrates the importance of examination of placenta tissue in cases of foetal losses. Both maternal and foetal evidences of inflammatory response were demonstrated in placenta on histopathological examination. The demonstration of gram positive cocci within the foetal blood through placental examination provides a definitive evidence of underlying intrauterine sepsis. Pathological evidences of underlying foetal compromise or death could be provided by well-represented samples of placental tissue. Examination of placenta tissue is of equal importance to other investigations as it may provide the only evidence of foetal infections.

ACKNOWLEDGEMENTS

We would like to thank the Director General of Health Malaysia for giving us permission to publish this case report.

CONFLICT OF INTEREST

The authors declare that they have no competing interests in publishing this case.

CONSENTS

Written informed consent was obtained from the patient to publish the case. A copy of written consent is available for review by the Chief Editor.

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Case Report

Dandy-Walker Syndrome in a Child at Rural Kelantan, Malaysia

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ABSTRACT

Dandy-Walker syndrome is a rare congenital malformation of the brain that involves the cerebellum and the fourth ventricle. It is characterised by a classical triad of hydrocephalus, cystic dilatation of the fourth ventricle and complete or partial agenesis of the vermis. Majority of cases are diagnosed during neonatal or early infantile period. In this case report, a seven-year-old boy complained of recurrent headaches for the past one year. Physical examination was unremarkable. Examination of the fundus on the same day revealed bilateral papilloedema. His subsequent computed tomography scan of the brain done at a major district hospital demonstrated features in keeping with Dandy-Walker malformation. Our case highlighted the importance of embarking on a detailed and thorough approach when dealing with a child with chronic headache, especially in rural settings where advanced medical equipment is not readily available.

Keywords: Dandy-Walker syndrome, hydrocephalus, chronic headache

INTRODUCTION

Dandy-Walker malformation represents a group of rare congenital abnormalities of the central nervous system with a reported incidence of one in 30,000 live births[1]. It is characterised by a neuro-pathological triad of hydrocephalus, cystic dilatation of the forth ventricle and complete or partial agenesis of the vermis[2]. Although commonly diagnosed in neonatal period, clinicians should have a high index of suspicion of chronic headache and vomiting and take this as a specific symptom of raised intracranial hypertension, unless proved otherwise.

CASE PRESENTATION

A seven-year-old boy presented with one year history of chronic and recurrent headache. Although unable to pinpoint the exact nature and site of headache, he commented that his symptoms occur almost on an every-other-day basis with no clear aggravating or alleviating factors. Besides, he suffers from recurrent vomiting episodes together with headache. Other associated symptoms, systems review, past histories, developmental history and social history were otherwise unremarkable. His mother expressed concerns that his headache has become increasingly disabling for the past few months as it was affecting both his sleep and learning opportunities at school due to frequent medical leaves. For the past one year, he was brought to nearby clinics on a few occasions to sought treatment where symptomatic analgesics were prescribed but to no avail.

Physical examination revealed an active and communicative child with no overt dysmorphic features. His height and weight were at the 50th centile and were consistent with his age. His head circumference was measured at 52 cm. Other parts of the examination including a thorough neurological examination were unremarkable. A fundoscopic examination of both eyes revealed presence of bilateral papilloedema (Figure 1).

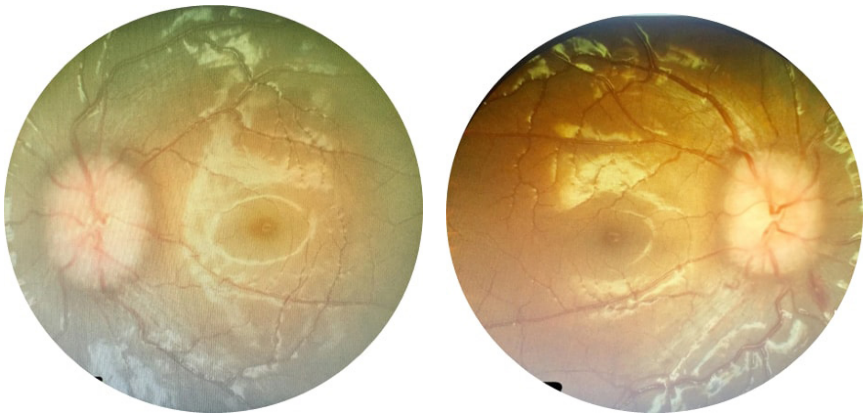

Figure 1 Bilateral fundus showing papilloedema

With a diagnosis of possible hydrocephalus or intracranial space-occupying-lesion in mind, he was sent to the nearest district hospital (approximately 90 km away) for an urgent computed tomography (CT) of the brain. CT scan report (Figure 2) demonstrated grossly-enlarged posterior fossa with agenesis of the cerebellar vermis associated with a dilated forth, third and both lateral ventricles. His corpus callosum appears to be normal with no other focal enhancing brain parenchymal lesion seen. These features are in keeping with Dandy-Walker malformation.

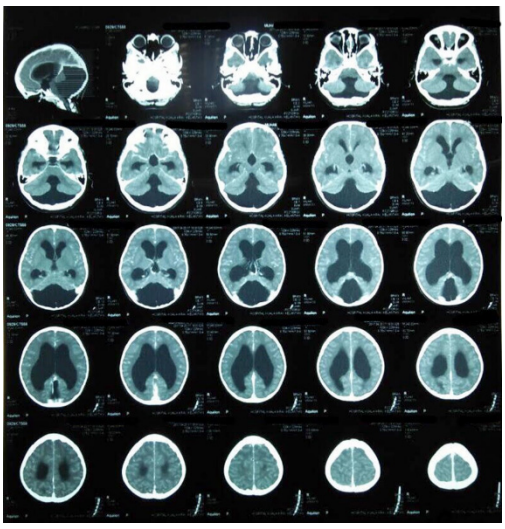

Figure 2 CT scan showing grossly-enlarged posterior fossa with agenesis of the cerebellar vermis associated with a dilated forth, third and both lateral ventricles

He was then transferred to a tertiary centre with neurosurgical support for further medical care and attention. A third ventriculostomy was subsequently performed endoscopically and went smoothly without complications, meaning that he was discharged well five days later. Both our patient and his mother reported resolution of headache during subsequent follow-up clinic visits.

DISCUSSION

Dandy-Walker syndrome refers to a rare congenital malformation of the cerebellum and the forth ventricle. It is worth mentioning that the term Dandy-Walker (or more precisely Dandy-Walker continuum) does not represent a single condition or entity, but rather several abnormalities of the posterior fossa that might

occur in isolation or might co-exist with each other. Current understanding identifies a few types of Dandy-Walker complexes, namely Dandy-Walker malformation, mega cisterna magna as well as Dandy-Walker variant[3]. Depending on the subtypes there may be a partial or complete absence of cerebellar vermis, an enlargement of the forth ventricle, as well as cyst formation adjacent to the base of the skull[4]. Various posterior fossa malformations and their association with brain anatomy are summarised in Table 1[4].

Table 1 Posterior fossa malformation type and relationship to brain anatomy[4]

	Cerebellar vermis	**Fourth ventricle**	**Brain stem**
Dandy-Walker malformation	Partially/ completely absent	Opens into large CSF-filled cyst	May be abnormal
Mega cisterna magna	Normal	Normal but large collection of CSF fluid	Normal
Dandy-Walker variant	Hypoplastic with variable-sized cyst	Mildly enlarged	Normal

Pathologically, it is believed that atresia of the foramina of Luschka and Magendie are responsible for such anomalies. An alternative explanation proposed by Benda mentioned that the syndrome represented errors in development in the region of forth ventricle but not limited to the foramina[5]. Recent researches indicated that Dandy-Walker syndrome might be related to various other conditions such as primary ciliary dyskinesia, polycystic kidney disease and Alstrom syndrome. Such conditions share a common pathology of dysfunctional ciliary motility that might come under an umbrella term named ciliopathies[6].

Patients with Dandy-Walker malformation typically exhibit symptoms during early infancy, including delayed motor development as well as progressive and disproportionate enlargement of the skull. In older children, symptoms of raised intracranial pressure such as irritability, vomiting, convulsion and headache do occur[5]. In our case, our patient was asymptomatic until the age of 6 where he starts developing recurrent headache and vomiting episodes.

Although there is no universal agreement regarding its management, some patients might benefit from neurosurgical procedures such as third ventriculostomy, or ventriculo-peritoneal shunts[7]. More importantly, the management of the patient with Dandy-Walker syndrome should be done in a holistic manner involving a multi-disciplinary team, including neurosurgeons, paediatricians, nurses, pharmacists as well as physiotherapists, occupational therapists, speech therapists, dieticians and specialised educators. Unfortunately, such specialised team might prove to be out of reach for a majority of people residing in rural areas (including our patient) facing issues with regards to assess to basic healthcare.

Moreover, it is vital to employ a systematic approach when dealing with a child with chronic headache. It is vital for clinicians to recognize that although the general approach to headaches in children is similar to that in adults, their manifestation can be less straightforward in children. Obtaining the exact description of headache might be challenging in young children. Thus, clinicians need to be more vigilant in eliciting collateral history from caretakers as well as explore the impact of headache on the child's behaviour and social capabilities. Fundoscopy remains a very important and safe procedure that should be performed in all children with symptoms suggestive of raised intracranial pressure. Chong SC (2004) in his article divides headache in children into four main clinical profiles based on clinical course[8] (Table 2). Various 'red-flags' in headache history that should alarm clinicians to a lower threshold for neuroimaging or further investigations[8] (Table 3).

Table 2 Differential diagnosis based on headache patterns[8]

Headache patterns	Possible aetiologies
Acute	*Localised* • Acute URTIs e.g. sinusitis, otitis media • Dental causes e.g. Dental abscess, temporal-mandibular joint dysfunction *Generalised* • Systemic infection e.g. meningitis *Central* • Acute intracranial haemorrhage
Acute recurrent	Migraine
Chronic, non-progressive	Psychogenic/ psychiatric causes Tension-type headache
Chronic, progressive	Space-occupying lesion Benign intracranial hypertension

Table 3 Redflags in headache history taking[8]

1.	A short history ('first' or 'worst') or recent recurrent severe headache for few weeks
2.	Headache suggesting raised intracranial pressure (vomiting in morning, pain disrobing sleep, early morning headache, headache worse with cough or Valsalva)
3.	Accelerated course, change in character over weeks or days
4.	Associated symptoms of personality changes, weakness, visual disturbances, focal weakness, confusion, seizures or fever
5.	Young age of child (less than three years old)
6.	Underlying history of neurocutaneous syndrome, history of systemic illnesses e.g. known malignancy with possible metastases, hypercoagulopathy

CONCLUSION

This case heightens the importance of doing complete neurological examination and developmental examination of a child with headache for one year with vomiting. To recommend early fundoscopic exam to rule out possible papilloedema for raised intracranial hypertension and do neuroimaging earlier.

ACKNOWLEDGEMENTS

We would like to thank the boy and his parents described for allowing us to share his details, and thanks to Dr Norhaizam and Dr Wee Koon Suan for performing and reporting CT imaging for our patient, as well as the entire neurosurgical team of Hospital Universiti Sains Malaysia (HUSM) for their professional care and efforts in managing our patient.

CONFLICT OF INTEREST

The authors declare that they have no competing interests in publishing this case.

CONSENTS

Written informed consent was obtained from the patient to publish the case. A copy of written consent is available for review by the Chief Editor.

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Case Report

Accidental Self-injection of Xylazine During Work: A Rare Case

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ABSTRACT

Xylazine is an alpha-2agonist often used as a sedative, analgesic and muscle relaxant agent in animals. Xylazine was not accepted by Food and Drug Administration (FDA) for human use due to hazardous side effect such as hypotension, bradycardia, respiratory depression and coma. This is a rare case report of a 64-year-old farmer who accidentally injected himself with Xylazine which was supposed to be given to a fractious cow. He developed altered conscious level, hypotension, bradycardia and respiratory failure requiring mechanical ventilation. Fortunately, he recovered and was discharged home after three days. This occurred due to improper handling of Xylazine without standard operating procedures. Xylazine is regulated for animal use only. Therefore, effects of Xylazine toxicity in human must be emphasized for awareness on proper handling as well as for right management of its poisoning incident in future.

Keywords: accidental injection, occupational hazard, toxicity, xylazine

INTRODUCTION

Xylazine is a type of non-opioid drug synthesized in Germany by Bayer (1962), used in animals as an analgesic, sedative and muscle relaxant[1]. It is a potent α2-adrenergic agonist that acts via stimulation of central α2-receptors. The α2 stimulation reduces the release of dopamine and norepinephrine in the central nervous system causing muscle relaxation, sedation and diminished perception of painful stimuli. Xylazine is not recognized by the FDA for human use[2]. It was examined in humans but rejected due to its common association with severe hypotension, bradycardia and central nervous system depression[3, 4].

According to a literature review by Ruiz et al. (2014), 43 cases of xylazine intoxication were reported in humans. Total of 21 cases were non-fatal scenarios in which most required supportive interventions while 22 cases resulted in fatalities. In most of the cases, xylazine consumption was accidental. Other reasons reported were suicidal, homicidal, recreational purpose or misused to treat insomnia and pain[5]. This case report will give awareness to everyone on proper handling of instrument and management in Malaysia in the future.

CASE PRESENTATION

A 64-year-old Indian farmer decided to sedate a fractious cow. No veterinarian was present at that time. When the farmer was about to give this medication to the cow in a 5-ml syringe with a 21G × 1.5" (0.8 × 40 mm) needle attached, the cow moved and the farmer accidentally injected himself at the flexor aspect of the forearm. He was holding the syringe's barrel instead of the plunger. Without realizing that, he coincidently injected a significant amount of drug to himself. He claimed that he was unable to recall how he jabbed the drug to his forearm. The patient has no any significant past medical or surgical history.

The farmer began to feel lethargic, giddy and weak within the tenth minute of the incident. Subsequently, his co-workers noticed him having unsteady gait. He also responded with slurring words to them. Immediately the farmer was taken to the emergency department.

On arrival he was noted to be drowsy, with slurred speech and abnormal flexion of the limbs, his Glasgow Coma Scale (GCS) was 10. His blood pressure was 164/91 mmHg and pulse rate was 76 beats/min. There was a small superficial puncture wound on his flexor aspect of his forearm. After 15 minutes, he became bradycardic and electrocardiogram showed sinus bradycardia with heart rate of 50 beats/min with no evidence of ischemic changes.

He was intubated in view respiratory depression and low GCS. He was given 2 litres of intravenous 0.9% normal saline over 2 hours. The National Poison Centre was consulted, but was told there is no antidote for xylazine and suggested for symptomatic management. He did not require any medications. He was observed in the Intensive Care Unit, had a good recovery and was extubated after 24 hours. He was well and discharged home after three days.

DISCUSSION

Xylazine is a potentially lethal drug if used in humans. This case report emphasizes the effect of xylazine in human as well as occupational exposure due to wide usage by veterinarian, veterinarian attendant, farmer, animal trainer or associated field. In overdose, central nervous system signs such as disorientation, blurred vision, dizziness, areflexia, numbness, dysarthria, syncopal, hyporeflexia, speech abnormalities or even coma can occur in patients. Besides that they can also develop respiratory impairment extending from laboured breathing to apnoea, cardiac effects such as hypotension, tachycardia, bradycardia, ventricular ectopic and even death[5].

The drug effects may last up to 4 hours in animals. Prolonged effects from 8 to 72 hours were noticed in reported cases of human overdose[6]. Supportive care to maintain cardio-respiratory function is more important in treating xylazine overdose[7]. Supportive treatment includes ventilatory support, fluid management, electrocardiographic (ECG) and blood glucose monitoring. Drugs such as yohimbine, phentolamine, and tolazoline which act as alpha-adrenergic antagonists' were recommended as antidotes for xylazine in animals; however they were not tested in humans[8].

When accidental injections occur, we should always seek medical advice immediately and show the package insert, data sheet or drug label to the physician so that they can take necessary steps to avert negative side effects. To prevent future occurrences of similar incidents, one should consult his/her veterinarian for safe handling and get training prior to administer injectable products. Next, one should properly restrain the animal before giving it the medication. Thirdly, loaded syringes should be handled with care and needles should be properly covered until use. One should never carry loaded syringes in his/her coat or pockets. One should not work alone while handling drugs. Lastly, one should clearly establish management protocols in case of accidents.

ACKNOWLEDGEMENTS

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CONFLICT OF INTEREST

The authors declare that they have no competing interests in publishing this case.

CONSENTS

Written informed consent was obtained from the patient to publish the case. A copy of written consent is available for review by the Chief Editor.

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Case Report

Cystic Artery Pseudoaneurysm: A Rare Cause to Obscure Upper Gastrointestinal Bleeding

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ABSTRACT

Obscure gastrointestinal bleeding is a surgical enigma of disastrous proportions. Patient's haemodynamic status often dictates the path of management ranging from endoscopy, embolization and/or surgery. Minority of the cases has failed to identify the exact source of bleeding during endoscopic and imaging techniques. Emergency surgery is warranted in hypovolaemic shock which has failed to respond to fluid and blood resuscitation. We present a 72-year-old male with an obscure upper gastrointestinal bleeding due to ruptured cystic artery pseudoaneurysm and illustrate the rarity of the presentation with successful management.

Keywords: obscure gastrointestinal bleeding, pseudoaneurysm, cystic artery

INTRODUCTION

Upper gastrointestinal bleeding (UGIB) is a common surgical admission to the emergency department. Initial management warrants fluid and blood resuscitation, proton pump inhibitor with subsequent definite intervention by an endoscopy. Rebleeding episode or failure to impede it endoscopically requires angiography and embolization in certain centre especially in developed countries. However, endoscopic and imaging techniques are unsuccessful to locate the source of bleeding in approximately 5% of patients[1]. Hence, it is calamitously labelled as obscure UGIB.

The management ranges from computed tomography of the abdomen, a three-vessel angiogram, red blood cell nuclear scan, small bowel enteroscopy, and ultimately surgical intervention. We present an interesting case of an obscure massive upper gastrointestinal bleeding due to a ruptured cystic artery pseudoaneurysm. This case illustrates the rarity of the presentation and successful management.

CASE PRESENTATION

A 72-year-old man presented to emergency department with a history of syncope and melena. He denied any history of haematemesis, abdominal pain, jaundice and fever to suggest of cholangitis or obstructive jaundice. He has intermittent episodes of biliary colic especially after taking fat-laden food which resolved spontaneously but no hospitalization, accident, endoscopic procedure and surgery before. He was clinically in hypovolemic shock and was significantly pale. Haematological investigation showed a haemoglobin level of 7 g/dL with no evidence of coagulopathy. His total white cell was 12×10^9/L. Following resuscitation, emergency oesophagogastroduodenoscopy (OGDS) was done, however no source of bleeding was identified. Following another subsequent episode of UGIB, a second OGDS was performed in which showing bleeding and pus passing from ampulla of Vater. An endoscopic retrograde cholangiopancreatography (ERCP) was performed and revealed gallstones

with filling defect in the common bile duct (Figures 1a and 1b). Subsequently, computed tomography angiogram (CTA) was preceded but yet failed to identify any source of bleeding.

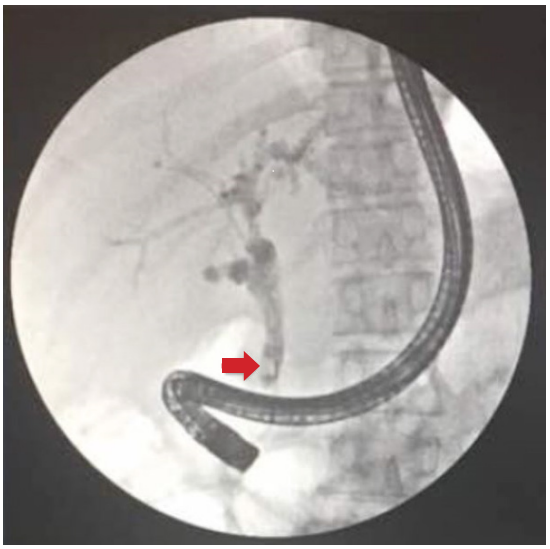

Figure 1a ERCP revealed a filling defect in the common bile duct suggestive of choledocholithiasis (red arrow)

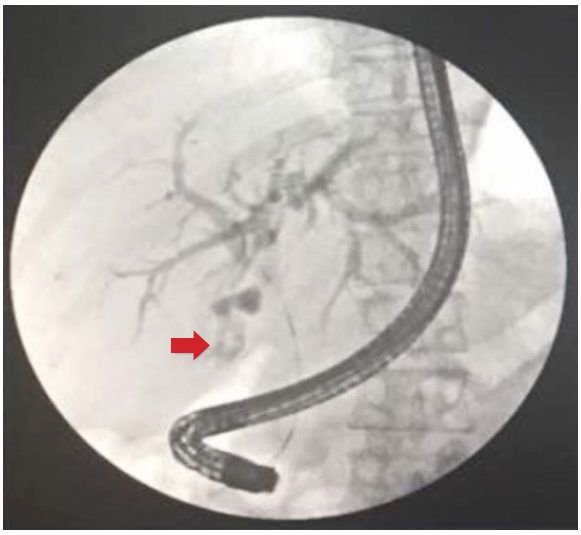

Figure 1b Another view of ERCP showed evidence of gallstones (red arrow)

In view of deteriorating haemoglobin level and further signs of worsening shock, he was subjected to an emergency laparotomy. Intra-operatively, the findings were intense inflammatory changes at Calot's triangle with pseudoaneurysm of the cystic artery. Cholecystectomy with ligation of cystic artery proximal to the pseudoaneurysm was undertaken. Post-operatively, the patient recovered well without any further blood loss and he was discharged successfully. Histopathological examination of the gallbladder was consistent with chronic inflammatory changes (Figures 2a and 2b).

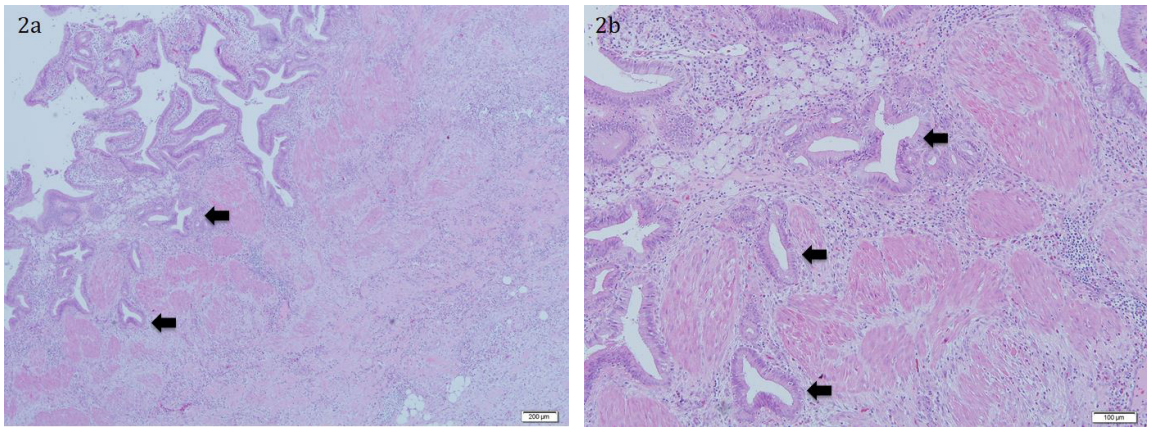

Figure 2 Histopathological examination of the gallbladder showed features of chronic cholecystitis as evidenced by presence of lymphocytic infiltration with Rokitansky-Aschoff sinuses (black arrows) at ×4 magnification (2a) and at ×10 magnification (2b)

DISCUSSION

Obscure UGIB has a variety of aetiologies. One of them is due to cystic artery pseudoaneurysm. The number of reported cases are scarce with only 24 cases being reported up to date[2]. Acute cholecystitis is one of the causative factors of a cystic artery pseudoeurysm to occur. It can lead to gangrenous necrosis which has a very high mortality rate[3]. The numbers of cystic artery pseudoaneurysm that occur are low in contrast to the high frequency of cholecystitis cases occurring worldwide. This possibly is a reflection of the pathological process that occurs with inflammation whereby the vessel is occluded earlier in the course of the disease[4].

Anatomically, cystic artery is a branch of right hepatic artery. A normal hepatic artery anatomy occurs in 89% of the population[5]. There are various common variants; ranging from a completely replaced hepatic arterial system with a gastroduodenal artery coming from the celiac axis and even from the superior mesenteric artery[6]. These anatomical variants represent the need for angiography upon development of an obscure intestinal bleed. In our case however, the angiography had failed to yield a positive result.

Patients typically present with Quinke's triad (upper quadrant pain, obstructive jaundice and gastrointestinal bleeding) to suggest of acute cholecystitis. However in our case, the patient directly presented with symptoms of UGIB. Even with the help of endoscopy, yet no obvious cause of the bleeding could be determined. An ERCP showed presence of gallstones that could have eroded chronically into the cystic artery. The eroded vessel had led to a bleeding in the biliary tree and subsequently causing UGIB. Francis Glison first described this presentation of UGIB in 1993[7]. A few decades have passed and these cases are still exceptional.

The presentation was further unusual as the patient denied any symptoms suggestive of cholecystitis that could possibly be related to the ruptured cystic artery pseudoaneurysm. The passage of pus and blood as seen during the ERCP contributed to a diagnostic dilemma. This event could possibly lead to a misdiagnosis and delay of treatment. The surgical specimen however showed inflammatory changes that explained the probable causative factor for the pseudoaneurysm formation.

Endovascular intervention remains the gold standard in managing cystic artery pseudoaneurysm despite its possible complication profiles such as hepatobiliary necrosis, bleeding, abscess formation and contrast related complications such as nephropathy and allergic reaction[4, 8]. However in cases where the presentation are vague and the diagnosis is in

doubt; surgical exploration, cholecystectomy and ligation of the pseudoaneurysm still prove to be an effective and safe way to treat this condition.

CONCLUSION

Any episode of non-variceal UGIB requires standard management which is acceptable worldwide. Resuscitation using fluid and blood transfusion, initiation of proton pump inhibitor and OGDS are imperative. If the diagnosis is dubious, step-up modalities are required such as angiography, ERCP and lastly surgical exploration.

CONFLICT OF INTEREST

The authors declare that they have no competing interests in publishing this case.

CONSENTS

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Describe your results in words, with reference to tables or graphs or figures when necessary. Present your results in logical sequence, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. When data are summarized in the Result section, give numeric results not only as derivatives (e.g. percentages) but also as the absolute numbers from which the derivatives were calculated, and specify the statistical methods used to analyze them. Restrict tables and figures to those needed to explain the argument of the paper and to assess its support. Use graphs as an alternative to tables with many entries; do not duplicate data in graphs and tables.

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ACKNOWLEDGEMENTS

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