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ZIKA VIRUS INFECTION;
KNOWLEDGE AMONG GYNECOLOGISTS AND PAEDIATRICIANS.

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ABSTRACT… Objective: To assess the knowledge of Zika virus infection in gynecologists and pediatricians **Study Design:** Cross sectional. **Setting:** Tertiary care public hospitals including Sardar Begam, and Allama Iqbal Memorial Hospitals, Sialkot; Services Institute of Medical Sciences and Jinnah Hospital, Lahore; and Pakistan Air Force Hospital, Islamabad (Pakistan). **Period:** July to December, 2016. **Method:** Calculation of sample size using $p = 0.5$ (inavailability of secondary data) in $n = z^2pq/d^2$ was followed by convenience sampling-based recruitment of the specialists. An indigenously developed questionnaire (Cronbach's $\alpha = 0.79$) was administrated to each subject for recording sociodemographic and professional information; and self-reporting to 12 close-ended items on Zika virus infection (ZVI) in women; and microcephaly in newborns. The knowledge was categorized as adequate/inadequate. **Results:** Overall 172 respondents included (response rate = 97.2%); and substantially higher rate i.e. ≥ 91.9% was found against each of the correct options. Consequently, 94.8% (n = 163) of them showed adequate knowledge (score 10-12 out of possible total = 12) on the infection and microcephaly. The knowledge had insignificant association with any of the sociodemographic/professional variables e.g. specialty ($p > 0.05$; χ^2 test). Similarly, post hoc multiple comparisons using Tukey's HSD test revealed insignificant difference among the mean values of score ($p > 0.05$) in 3 occupational positions viz. Foundation doctors (M = 11.29, *SD* = 1.13), trainee doctors (M = 11.26, SD = 0.81), and consultants (M = 11.40, SD = 0.82). **Conclusion:** Gynecologists and pediatricians had adequate level of the infection and microcephaly-related knowledge; though lack disease-oriented attitude and practical handling.

Key words: Cross Sectional Study, Gynecology, Knowledge, Pakistan, Pediatrics, Zika Virus Infection.

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INTRODUCTION

Human viral problem couples lack of vaccination (usually), terrfied morbidity and difficult management; though easily preventible. In 2016, the World Health Organization (WHO)[1] declared emergency after outbreak of Zika virus infection (ZVI) in some countries. Generally, the sufferer is unaware of its attack on account of no evident symptom(s). However, there is a chance of misdiagnosis in symptomatic cases as infection share symptoms with dengue fever and chikungunya.[2] Viremic pregnant woman can face two adverse consequences i.e. ophthalmic problems with/without microcephaly in newborn; and neurological complications e.g. Guillan-Barré syndrome[3] - an auto immune disorder. Such outcome have serious socio-economic concerns.

ZIKV- infected female mosquito (*Aedes aegypti* or *Aedes albopictus*) is the major route of viral transmission. So, people especially pregnant women are advised to avoid travel to the ZVI-affected countries; or unexpose to the vector if stay is inevitable.[4] Reciprocally, the moquitoes or their larvae can have access to any ZVI-free region of the world via air or sea cargo ships just like dengue virus-infested larvae in Pakistan. Other transmission routes include unprotected sexual contact, transfusion of contaminated blood or contact with body fluids. So, breastfeeding mother should be non-viraemic. On the other side, a person returning from affected countries is advised to refrain from unsafe sexual intercourse for stipulated time period.[5]

Pakistan is amongst the ZVI-vulnerable countries

on account of previously reported serological evidence of the virus;[6] heavy traffic of travellers at International airports;[7] and non-precise arbovirus surveillance system. Furthermore, the unidentified sufferers avoid hospital visit and wait for automatic recovery. Due to inavailability of reliable statistics of the cases, state is unable to frame any target-oriented policy. However, establishment of purpose-built clinical laboratories[8] as per guidelines of WHO and United States Centres for Disease Control and Prevention is a sign of somewhat preparedness and mitigation for probable future outbreak. Despite it, protocols for ZVI diagnosis are out of the routine practices even in well reputed private diagnostic laboratories.

Surprisingly, the ZVI involves neither vaccination[9] nor medical therapy; hence sole preventive measures acquire significance. In the absence of attitude and practice of any disease (e.g. ZIV in Pakistan), the health care providers get knowledge through print and electronic media, WHO's guidelines, reserach articles and interactivities like conferences. Browsing online literature revealed plenty of work on ZVI-related knowledge in different segments of health care providers including gynecologists, neonatlogists and pediatricians of other countries. However, our team found only one published paper (Iffat et al)[10] on such awareness among general medical practitioners in Pakistan. This rareness in literature pointed out a research gap to fill. This is why present study aimed to assess the knowledge in two specialities i.e. gynecology and pediatrics. The study will open new horizons for others to fuel the state policy for mitigation and preparedness against probale ZVI outbreak.

METHODOLOGY

Six tertiary care hospitals of 3 cities i.e. Pakistan Air Force Hospital, Islamabad; Services Institute of Medical Sciences and Jinnah Hospital, Lahore; and Sardar Begam and Allama Iqbal Memorial Hospitals, Sialkot were selected, conveniently. All the cities have International airports and share (except Islamabad) geopolitical boundaries with India.

In present cross sectional study, the sample size ($n = 171$) was calculated using $p = 0.5$ in a formula: $n = z^2pq/d^2$. All gynecologists (or obstetrics) and pediatricians (or neonatologists) of the hospitals made the study population. Participants were registered after getting positive response against a question (Do you Know about ZVI?) while negative against (Do you have ZVI-related attitude and experience?). However, all those were excluded who refused to furnish written participation consent; holding MD (Doctor of Medicine) degree; serving as medical academician or official.

A close-ended questionnaire was framed after discussion with concerned specialists; and information of US CDC. The internal consistency (Cronbach's $\alpha = 0.79$), semantic validity and pretesting was monitored by a team of linguistic professionals and human psychologists. It included two sections viz. Section-A (sociodemographic and professional information); and B (ZVI-related 12 items of 4 choices each). Correct answer carried 1 while incorrect 0 Marks. Open time was awarded to on duty practitioners for convenience. The awareness of the ZVI was defined as poor (score of 0-6), average (7-10) and good (10-12) whereas poor or average level = inadequate and good level = adequate knowledge.

Advance approval was sought from the Ethics and Research Committee (ERC) of the Idrees hospital, Sialkot Cantt, Punjab province, Pakistan vide Letter No. IHS/ERC/18-2016. The study was conducted from July 1 to December 31, 2016.

Rate of responses and Mean (±SD; range) of the score on knowledge were calculated in descriptive statistics using SPSS version 16.0 (SPSS Inc., Chicago, IL). Chi-squared test was used to see association of awareness level (adequate/inadequate) with sociodemographic characteritics of the respondents. Output of post hoc multiple comparison was obtianed processing the score in Tukey'S HSD test. In both the tests, a p-value (<0.05) was considered as significant one.

RESULTS

Response rate of recruited practitioners to the

questionnaire on Zika virus infection-related items was found to be 97.2% (n = 172) as shown in flow sheet (Figure-1). Out of all respondents, 101 (58.7%) were females while mean age was noted as 30.77 (SD = 9.52; range 23-55) years. However, female and male population dominated in gynecology (97.1%, n = 99) and pediatrics (97.1%, n = 68) specialty, respectively (Table-I). Amongst 3 occupational positions, 'foundation doctors' had a prominent proportion with percent frequency of 41.9% (n = 72). The statistical processing of time since graduation revealed values: M = 7.23, SD = 9.19 (range 0-32) years. Most of the subjects i.e. 129 (75%) reported MBBS as the highest professional qualification.

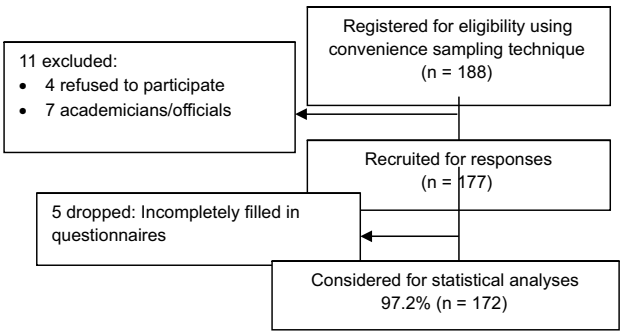

Figure-1. Flow sheet showing subject sampling

Nearly all respondents (98.8%) marked correct option 'Aedes egypti' when asked about major vector of the virus (Table-II(a)). However, 94.8% considered unsafe sexual contact as major (2nd to mosquito) ZIKV transmission route; 94.8% opted 'some time' against rate of fetal mortality; while 91.1% advised 'Avoid mosquito bite' for travelers to ZVD-affected countries. Similarly, 93.6% of the practitioners believed a gap of 6 months between arrivals of a ZVI- suspected person and episode of sexual intercourse.

Table-II(b) shows responses related to ZVI-affected men/non pregnant women. According to substantially higher numbers of responders, 167 (97.1%) maculopaplar rashes was the distinguished symptom of ZVD. Urine became the choice of 93.6% subjects during an item on sampling material to diagnose the disease. An option 'RT-PCR Zika' got highest score (93.6%, n = 161) with reference to recommended test for viral detection. Similarly, a response rate, 93.0% was found against ZVD management modality 'fluid rehydration plus medication'.

Recalling knowledge on diagnostic tests, 95.3% (n = 164) subjects reported both, RT-PCR and ZIKV serology for confirmation of symptoms of ZVD in suspected (for ZVD) pregnant woman as depicted in Table-II(c). Need of ultrasound technique (after 21st week of gestation) was opted by subjects (92.4%) for confirmation of microcephaly. Similarly, 91.9% thought 'ophthalmic evaluation within 1 month plus cranial ultrasound within 2 months of birth' suitable for diagnosis of microcephaly.

Comparatively higher rate of adequate knowledge (score 10-12) i.e. 97.2% (n = 69) was seen in male responders (Table-III). Such rate was also found in pediatrics (97.1%, n = 69), consultants (95.3%, n = 41) or higher (than MBBS) degree holders (95.3%, n = 41). Furthermore, statistically insignificant association was noticed between level of knowledge and any of the baseline information ($p > .05$; Fisher's exact test). Moreover, post hoc multiple comparisons (through Tukey's HSD test) revealed insignificant differences ($p > .05$) among mean score of foundation doctors, 11.29 (SD = 1.13), and two other occupational positions (footnote of Table-II(c).

A clear line chart (Figure-2) developed when independent scores of the respondents were statistically analyzed to determine the rate of sublevels of ZVD's awareness. The highest rate i.e. 94.8% (n = 163) was found against good sub level of adequate level.

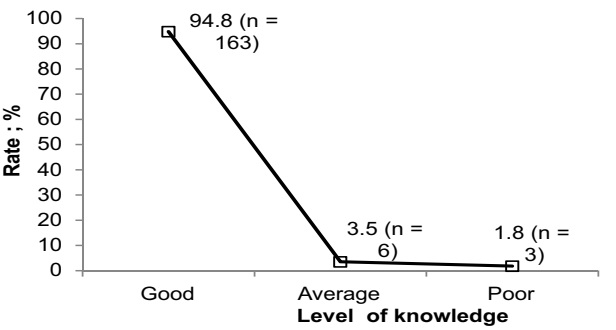

Figure-2. Rate of awareness levels regarding ZVD (n=172)

Characteristic		Statistical output[a]
Gender		
Male		41.3 (71)
Female		58.7 (101)
Age; Mean ± SD (range) yrs		30.77±9.52 (23-55)
Professional specialty		
Gynecology	Male Female	2.9 (3) 97.1 (99)
Pediatrics	Male Female	97.1 (68) 2.9 (2)
Service-rendering position	Foundation doctor	41.9 (72)
	Trainee doctor	33.1 (57)
	Consultant*	25.0 (43)
Time since under graduation; Mean ± SD (range) yrs		7.23±9.19 (0-32)
Highest professional qualification	MBBS	75.0 (129)
	>MBBS	25.0 (43)

Table-I. Baseline information of the participants (n = 172)
[a]% (n) unless otherwise stated; Yrs – years; *medical/surgical

Truncated* item	Option (%, n)	
Vector of Zika virus (ZIKV)	Culex pipens (-)	***Aedes egypti*** (98.8 , 170)
	Aedes biloba (1.2, 2)	Anophlese gambie (-)
Major route of viral transmission	Lip kissing (1.7, 3)	***Sexual contact*** (96.5, 166)
	Aerosol spread (1.2, 2)	Laboratory exposure (0.6, 1)
ZVD - fetal death association	Always (-)	***Some time*** (94.8, 163)
	Never (4.1, 7)	I Don't Know (1.2, 2)
Advice for travelers to ZVD- prevalent country	Use insect repellent (4.7, 8)	Wear long-sleeved cloths (-)
	Stay away from beach (3.5, 6)	***Avoid mosquito bite*** (91.9, 158)
A ZVD-suspected man (travelled from abroad) can avail unsafe sexual intercourse after:	I don't know (2.9%, 5)	No time limit (-)
	14 days of arrival (3.5, 6)	***6 months of arrival*** (93.6, 161)

Table-II(a). Rate of tranmission, fetal mortality and prevention-related responses (n = 172)
***incomplete; (-) denotes zero values; Italicized & bold (correct option)**

Truncated item	Option (%, n)	
Distinguished symptom of ZVD	Low grade fever (-)	High grade fever (1.7, 3)
	Maculopaplar rash (97.1, 167)	Signs of bleeding (1.2, 2)
Sampling material for clinical diagnosis of ZVD	Saliva (1.7, 3)	***Urine*** (93.0, 160)
	Feces (1.7, 3)	Cerebrospinal fluid (3.5, 6)
Quantitative diagnostic test for viral detection	CST Zika (6.4, 11)	Nasopharyngeal swab analysis(-)
	RT-PCR Zika (93.6, 161)	ELISA Zika (-)
Clinical management of ZVD	Antiviral therapy (5.2, 9)	NSAIDS (-)
	Medication for symptoms (1.7, 3), pl.	***Fluid rehydration plus medication for symptoms*** (93.0, 160)

Table-II(b). Transmission, mortality and prevention of ZVD-based responses (n = 172)

Truncated item	Option	% (n)
Test for symptomatic (for ZVD) pregnant women	ZIKV serology (e.g. ELISA)	2.3 (4)
	ZIKV rRT-PCR*	2.3 (4)
	Both, ZIKV serology and PCR	95.3 (164)
	None of these	-
Gestation time (in weeks) when probability of fetal microcephaly can be confirmed by ultrasound technique	10	2.3 (4)
	19	4.7 (8)
	21	92.4 (159)
	27	0.6 (1)
Major diagnostic test(s) for suspected infants for microcephaly	Cranial ultrasound within 2 months of birth	2.9 (5)
	Toxoplasma and CMW infections within 6 months of birth	4.1 (7)
	Ophthalmic evaluation within 1 month and cranial ultrasound within 2 months of birth	91.9 (158)
	All of these	2.1 (2)

Table-II(c). Responses about suspected pregnant women and infants
***Real-time reverse transcriptase polymerase chain reaction,**

Variable	ZVD awareness; % (n)		P-value
	Adequate	Inadequate	
Gender			
Male	97.2 (69)	2.8 (2)	0.31
Female	93.1 (94)	6.9 (7)	
Medical specialty			
Gynecology	93.1 (95)	6.9 (7)	0.21
Peads	97.1 (69)	2.9 (2)	
Professional position			
HO and Trainee*	94.6 (122)	5.4 (7)	0.60
Consultant	95.3 (41)	4.7 (2)	
Highest academic qualification			
MBBS	94.6 (122)	5.4 (7)	0.60
Higher than MBBS	95.3 (41)	4.7 (2)	

Table-III. Baseline information versus ZVD's awareness in participants (n = 172)
HO – House officer,*in FCPS; foundation doctors (M = 11.29, SD = 1.13), trainee doctors (M = 11.26, SD = 0.81), and consultants (M = 11.40, SD = 0.82) - p > 0.05

DISCUSSION

Probable ZVI-related problems including microcephaly in fetuses is a direct concern of gynecologists[11,12] followed by pediatricians; so both the specialties are at frontlines. Similarly, decision-making capacity in the practitioners not only support to take part in research study but also satisfy the patients as the sufferers expect domination of decision process from the experienced health care handlers.[13,14,15] Mere knowledge becomes important in the absence of disease-related experience and/or attitude.

Unsafe sexual contact is 2nd to *Aedes egypti* mosquitoes in transmission of the ZIKV.[16,17] The respondents seem to have adequate knowledge of these routes ZVD-associated mortality rate in fetuses. However, ZVD- fetal mortality association necessitates intensive sustainable probing.[12] There is no contradiction in guidelines of WHO[18] and approach of responders about sexual intercourse by a ZVD-suspected person.

Clinicians generally perceive ZVI on noticing macropapular rashes as other symptoms share among dengue fever (EDC)[19], chikungunya and ZVI. [20] The sharing may lead to misdiagnosis. Substantially higher rate of respondents against RT-PCR Zika – an established clinical test for quantitative load management of the virus show interest in diagnostic sides. The test is effective where cross-reactivity in diagnostic tests for

related falviviruses exists. In the absence of antiviral therapy,[21] symptomatic medication is the part of medical management of the infection.

Combination of ZIKV rRT-PCR[22] and ZIKV serology help in confirmation of virus in the suspected pregnant women. Subjects of present study seem unanimous in this clinical finding. Similarly, practitioner advises ultrasound (at 21 weeks of gestation) to see any anatomical abnormality e.g. cerebella hyperplasia[23] for counter measures. Ophthalmic evaluation to see possible cortical visual impairment[24] helps in decision for microcephaly. Furthermore, cost-effectiveness makes this modality a preferred one.

Acquisition of a disease-related knowledge especially in health care providers is usually independent of any socio-demographic or professional characteristics as observed. It is in accordance with similar studies such as on ZVD-related knowledge in general community,[25] or in gynecologists, neonatologists and pediastricians.[26] However, a contradiction was seen with Harapan and associates[27], showing increase in ZVD-related knowledge with increase in occupational position of medical/surgical practitioners. Both, integration of ZVD-related information in study curriculum of MBBS degree course and access to online media equip the junior doctors with its knowledge. However, higher education (> MBBS) definitely increases the canvas of knowledge.[28]

Health care providers are supposed to have maximum knowledge about any viral infection. The subjects of present study fulfill the criteria as rate of good/adequate knowledge hit a rate of 94.8%. Whereas sufficient level of knowledge in the vulnerable community like reproductive-age women is appreciable.[29] Present pilot study ignored inclusion of medical specialists and neurologists due to certain constrains; though former specialty deals with certain ZVI-associated complications while later can handle Guillan-Barré syndrome, appropriately.

CONCLUSION

The subjects are well-equipped with knowledge on ZVD especially in the areas of diagnostic tests, management, and prevention for pregnant women (and their fetuses or infants), non-pregnant women and adult men. Presence of good level knowledge, without any physical handling of ZVD cases and or relevant attitude marks their seriousness in counter disease measures.

REFERENCES

1. World Health Organization. **Situation report: Zika virus, microcephaly, Guillan-Barré syndrome.** Geneva: World Health Organization. 2016[a]: 1-6. Available at http://apps.who.int/ iris /bitstream/10665/251462/1/ zikasitrep17Nov16-eng.pdf. [Accessed Feb 15, 2018].
2. Patterson J, Sammon M, Garg M. **Dengue, Zika and Chikungunya: Emerging arboviruses in the new world.** West J Emerg Med 2016; 17(6):671-79.
3. Cao-Lormeau V, Blake A, Mons S, Lastere S, Roche C, Vanhomwegen J et al. **Guillain-Barré Syndrome outbreak caused by ZIKA virus infection in French Polynesia.** Lancet 2016; 387(10027):1531-39.
4. World Health Organization. **Situation report: Zika virus, microcephaly, Guillan-Barré syndrome.** Geneva: World Health Organization. 2016[b]: 1-7. Available at http:// apps. who. Int /iris/bitstream/10665/249573/2/ zikasitrep25Aug16-eng.pdf. [Accessed Feb 17, 2018].
5. Kim CR, Counotte M, Bernstein K, Deal C, Mayaud P, Low N et al. **Investigating the sexual transmission of Zika virus.** Lancet Glob Health 2018; 6(1): e25-e25.
6. Darwish MA, Hoogstraal H, Roberts TJ, Ahmed IP, Omar F. **A sero-epidemiological survey for certain arboviruses (Togaviridae) in Pakistan.** Trans R Soc Trop Med Hyg 1983; 77(4): 442–45.
7. Butt AM, Siddique S, Gardner LM, Sarkar S, Lancelot R, Qamar R 2016. **Zika virus in Pakistan: the tip of the iceberg?** Lancet Glob Health 2016; 4(12):e913–e914.
8. Khalid M, Khan SA, Ahmed AA. **Zika Virus in Pakistan: A Looming Adversity?** – A Letter to Editor. J Coll Phys Surgeon Pakistan 2016; 26(11): 943.
9. Plourde AR, Bloch EM. **A Literature Review of Zika Virus.** Emerg Infect Dis 2016; 22(7): 1185-1192.
10. Iffat W, Shakeel S, Fasih F 2016. **Pakistani healthcare practitioners' understanding of the Zika virus disease.** J Health Edu Res Dev 2016; 4:185.
11. Lin JJ, Chin TY, Chen CP, Chan HL , Wu TY. **Zika virus: An emerging challenge for obstetrics and gynecology.** Taiwanese J Obstet Gynecol 2017[a]; 56(5): 585-592.

12. Lin HZ, Tambyah PA, Yong EL, Biswas A, Chan S-Y 2017[b]. **A review of Zika virus infections in pregnancy and implications for antenatal care in Singapore.** Singapore Med J 2017[b]; 58(4): 171-178.

13. Hindmarch T, Hotopf M and Owen GS 3013. **Depression and decision-making capacity for treatment or research: a systematic review.** BMC Medical Ethics 2013; 14(1): 54.

14. Worthy DA, Gorlick MA, Pacheco JL, Schnyer DM, Maddox WT. **With age comes wisdom: decision-making in younger and older adults.** Psychol. Sci 2010; 22(11): 1375-1380.

15. Budych K, Helms TM, Schultz C. **How do patients with rare diseases experience the medical encounter? Exploring role behavior and its impact on patient–physician interaction.** Health Policy 2012; 105(2-3): 154-164.

16. Hunter FF. **Linking only Aedes aegypti with Zika virus has world-wide public health implications.** Front Microbiol 2017. 8:1248.

17. Allard A, Althouse BM, Hébert-Dufresne L, Scarpino SV. **The risk of sustained sexual transmission of Zika is underestimated.** PLoS Pathogen 2017; 13(9): e1006633.

18. World Health Organization. **Knowledge, attitude, practice surveys Zika virus disease and potential complications – Resource Pack.** Geneva: World Health Organiztion. 2016[c]

19. **European Centre for Disease Prevention and Control. Rapid risk assessment: Zika virus epidemic in the Americas: potential association with microcephaly and Guillain-Barré syndrome - 10 December 2015.** Stockholm: ECDC. Available at http://ecdc.europa.eu/en/publications /_ layouts/forms/Publication_DispForm.aspx?List=4f55ad51-4aed-4d32-b960-af70113dbb90&ID=1413.

20. Khawar W, Bromberg R, Moor M, Lyubynska N, Mahmoudi H. **Seven cases of Zika virus infection in South Florida.** Muacevic A, Adler JR, eds. Cureus 2017; 9(3):e1099.

21. Falcao MB, Cimerman S, Luz KG, Chebabo A, Brigido HA, Lobo IM et al. 2016. **Management of infection by the Zika virus.** Ann Clin Microbiol Antimicrob 2016; 15(1): 57.

22. Eppes C, Rac M, Dunn J, Versalovic J, Murray KO, Suter MA et al. **Testing for Zika virus infection in pregnancy: key concepts to deal with an emerging epidemic.** American J Obstet Gynecol 2017; 216(3): 209-225.

23. Benjamin I, Fernández G, Figueira JV, Parpacén L, Urbina MT, Medina R. **Zika virus detected in amniotic fluid and umbilical cord blood in an IVF-conceived pregnancy in Venezuela.** Fertil Steril 2017; 107: 1319-1322.

24. de Paula Freitas B, de Oliveira Dias JR, Prazeres J, Sacramento GA, Ko AI, Maia M et al. **Ocular Findings in infants with microcephaly associated with presumed Zika virus congenital infection in Salvador, Brazil.** JAMA Ophthalmol 2016, 134(5): 529-535.

25. Samuel G, DiBartolo-Cordovano R, Taj I, Merriam A, Lopez JM, Torres C et al. **A survey of the knowledge, attitudes and practices on Zika virus in new York City.** BMC Public Health 2018; 18: 98.

26. Yung CF, Tam CC, Rajadurai VS, Chan JK, Low MS, Ng YH et al. **Rapid assessment Zika virus knowledge among clinical specialists in Singapore: A cross-sectional survey.** PLOS Currents Outbreaks, Edition 1. 2017 doi: 10.1371/currents.outbreaks.44b19196298e01f3a6dcd4c09 f23 5fa8.

27. Harapan H, Aletta A, Anwar S, Setiawan AM, Maulana R, Wahyuniati N et al. **Healthcare workers' knowledge towards Zika virus infection in Indonesia: a survey in Aceh.** Asian Pac J Trop Med 2017; 10:189–194. doi:10.1016/j.apjtm.2017.01.018.

28. Gupta N, Randhawa RK[1], Thakar S, Bansal M, Gupta P, Arora V. **Knowledge regarding Zika virus infection among dental practitioners of tricity area (Chandigarh, Panchkula and Mohali), India.** Niger. Postgrad Med J 2016; 23: 33-37.

29. Michael GC, Aliyu I, Grema BA, Ashimi AO. **Knowledge of Zika virus disease among reproductive-age women attending a general outpatient clinic in Northern Nigeria.** S Afr Fam Pract 2017; 59(4):148-153.

What worries you, masters you.

– Unknown –

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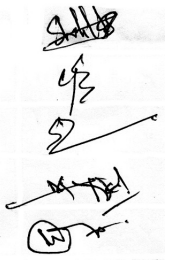
1	Syed Shah Hassan	Coordinator and Writer	
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