ORIGINAL ARTICLE

Association of the drug of abuse in road traffic collision death in Hospital Kuala Lumpur

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ABSTRACT

Introduction: The role of pathologist not only confined in performing post mortem but also can assist in prevention. The aim of this study to determine the prevalence and association of drug of abuse (DoA) in road traffic collision (RTC) at Hospital Kuala Lumpur.

Methods: This is a retrospective study of post mortem cases at Hospital Kuala Lumpur from 2014 to 2016. Deaths from RTC were included while decomposed and homicide cases were excluded. We performed Spearman Correlation statistical test to relate RTC and positive DoA results.

Results: A total of 523 RTC cases were identified in which either blood or urine or both samples were taken for toxicology. 93 cases were positive for both DoA and therapeutic drugs. A total of 37 cases were positive for DoA. Alcohol was present in 5 out of 37 DoA positive cases. Most of the cases seen among 16 to 45 years old (69%) and predominantly in males (93.1%). 29 out of 37 were motorcyclist and the rest were pillion rider and pedestrian. Spearman Correlation statistical test showed a negative relationship between RTC and positive DoA results.

Discussion and Conclusion: Majority of the DoA cases in RTC were identified in the younger age group and among the motorcyclist. Spearman Correlation statistical test showed that more cases of DoA died in natural or suicidal manner compared to RTC. However, this doesn't reflect the true association of DoA in RTC. This is because of mainly two factors which the delayed effect of DoA that gives negative toxicology test and also the influence of other road users on DoA.

KEY WORDS:
Road Traffic Collision; Drug of Abuse; Post mortem

INTRODUCTION

World Health Organization defined collision when occurred on a public road and involved at least one moving vehicle.[1] The number of people killed in road traffic collisions in Malaysia each year is devastating. In 2016, 7152 deaths were reported out of 521466 road collisions.[2] Road traffic collisions also are the second-leading cause of death worldwide for children aged 5–14 years and young people aged 15–29 years.[1]

The role of the pathologist in connection with road traffic collision (RTC) deaths deals with post mortem examination, reconstruction of events, collection of samples for toxicological analysis and producing evidence for investigators. A team of investigators may consist of traffic and law enforcement officers, police investigating officers, the prosecutor, toxicologists, chemists, medical examiners, and the pathologist. The purpose of the team is to reconstruct the facts surrounding the RTC and the death. The team's investigation includes carefully assembled written reports and drawings on the details of the accident, the scene and the damaged vehicles as well as scientific and medical reports. The autopsy report enumerates the injuries, determines the cause of death and frequently reconstructs circumstances such as time and manner of death.

The contributors for RTC can be categorized into four groups. They are categorized as mechanical factors, human factors, environmental factors and chemical factors. This study focused on the influence of the chemical factor in RTC. The medical, physical, mental and emotional effects of drugs may impair the driving ability and consequently cause RTC. In addition to that, the level of drugs to cause an effect on an individual varies depending on the individual factors and pharmacokinetics of the drug itself. Women are usually affected at a low level and chronic alcoholic will usually require a higher level to produce similar effect due to tolerance.[3] Often, the effect of drugs is attenuated whenever in a combination with alcohol.[4]

The law prohibits people from driving vehicles under the influence of drugs that affect driving performance. Thus, forensic autopsies on RTC fatalities analyze blood to look for evidence of drug intake prior to death. Analytical laboratories have used gas chromatography-mass spectrometry (GCMS) and high-performance liquid chromatography-tandem mass spectrometry (HPLC-MS-MS) to perform simultaneous qualitative analyses for approximately 300 types of drugs, including banned substances, psychoactive drugs, and sleeping pills, to determine whether the corresponding drivers were under the influence of drugs at the times of their respective RTC.[5]

MATERIALS AND METHODS

This was a retrospective study of all post mortem cases involving Road Traffic Collision (RTC) death in the year

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2014-2016 at Forensic Department Hospital Kuala Lumpur. The inclusion criteria were cases that involved in RTC death with their blood and/or urine were sent for toxicology analysis and obtained results. Decomposed cases and homicidal vehicle collision were excluded from this study. This study reflects the cases from the jurisdiction of Kuala Lumpur Traffic police. The toxicology sample which was taken during post mortem was collected in a bottle that contained natrium fluoride which acts as a preservative. The specimen then was sealed by the Forensic Medicine Department, Hospital Kuala Lumpur before the samples were sent to an accredited laboratory at the Department of Chemistry Malaysia. Data for this study which includes toxicology reports were retrieved from the post mortem files. The RTC death cases were identified and the respective post mortem reports were retrieved to identify the category of victims. The results were analyzed using descriptive statistics. The prevalence and relatedness using statistical analysis were computed.

RESULTS

Based on inclusion criteria, a total of 523 RTC death cases out of 1723 post mortem cases from Hospital Kuala Lumpur between the year 2014 – 2016 were identified. The cases had either blood or urine samples or both samples sent for toxicology analysis. Positive toxicology means positive for both drugs of abuse (DoA) and therapeutic drugs. A total of 93 RTC death cases (17.8%) with positive toxicology results were detected. The majority involved was aged from 16 to 45 years old (59.1%), followed by more than 45 years old (35.5%) and less than 16 years old (5.4%). There were almost equal numbers of cases that occurred in the day (7 AM to 7 PM) and night (7 PM – 7 AM). Total of 82 out of 93 RTC death cases (88.2%) with positive toxicology results were Malaysian and the rest were foreigners. There were 43 Malay (52.4%), 20 Chinese (24.4%), 13 Indian (15.9%) and 6 other races (7.3%) among Malaysian citizen with positive toxicology involved in RTC death cases.

Out of the 93 cases with positive toxicology results, alcohol was also detected with combination with drugs of abuse in 5 RTC death cases (16.1%) with a wide range from 46mg/100ml to 428 mg/100ml in their blood and/or urine specimen. In addition to that, there were 127 out of 523 RTC death cases (24.3%), were only positive for alcohol within the range of 27mg/100ml to 569mg/100ml in their respective blood, urine and/or vitreous humour specimens.

The prevalence of the positive DoA in RTC cases was low at 7.07% (37/523). Out of 37 positive DoA, motorcyclist was identified in 29 cases, 6 in pedestrian and 2 in pillion rider. There was no drug of abuse identified in cases from other drivers such as car driver, bus driver, and lorry driver. From the motorcyclists involved with positive DoA, they were Malaysian aged from 19 – 68 years old with the majority of the age group were within 16 – 45 years old (69%), 93.1% were males and 62.1% were Malay and 58.6% of them occurred during day (7 AM – 7 PM) as shown in Table 1 and Figure 1. Nevertheless, there were 5 out of 29 of them also presented with positive alcohol level ranging from 63mg/100ml – 308mg/100ml at the same time causing the synergic effect of the DoA. The cause of death in all these cases were either multiple injuries and head and/or chest injuries.

The analysis was further conducted based on the type of drugs detected as shown in Table 2. We have categorized the results into the drug of abuse (DoA) and therapeutic drugs. DoA includes stimulants (ST), opiates (OP), cannabis and ketamine (CK). Stimulants include amphetamine, MDMA (3,4-methylenedioxymethamphetamine), MDA (methylenedioxy-amphetamine) and methamphetamine. Opiates includes EDDP (2-ethylidene-1,5-dimethyl-3,3-diphenylpyrrolidine), morphine, 6-MAM (6-monoacethylmorphine), methadone. Examples of therapeutic drugs detected were chloroquine, chlorpheniramine, dextromethorphan, diphenhydramine, ibuprofen, lidocaine, metoclopramide, metronidazole, orphenadrine, paracetamol, phenytoin, antidepressant and benzodiazepine i.e. amitriptyline, chlorpromazine, clozapine, diazepam, midazolam, nimetazepam, nitrazepam, nordiazepam, nortriptyline, olanzapine, oxazepam, promethazine, and temazepam.

The detection rate of the positive drug of abuse (DoA) which includes stimulants, opiates, cannabis and ketamine in blood specimens were 6.9% or 33 out of 476 cases in which blood samples sent for toxicology. The detection rate was higher in the urine samples. The detection rate of DoA in urine specimens were 11%, out of 291 RTC death cases for which urine samples were taken. The detection rate for therapeutic drugs in blood and urine with 11.1% (53/476) and 10.0% (29/291) respectively based on the total tests requested in RTC death cases.

In addition, we have performed Spearman Correlation statistical test and obtained a negative relationship between the type of cases and positive DoA results. RTC cases are apt to have more towards negative DoA results compared to non-RTC cases with $r(1723) = -0.06$, $p < 0.05$ as revealed in Table 3. This means that compared to our other non RTC post mortem cases, in cases with significant DoA, more deaths reported in a natural and suicidal manner compared to RTC.

DISCUSSION AND CONCLUSIONS

Motorcyclist contributed the highest number of fatalities as the motorcycle is a choice for people to commute in Kuala Lumpur to avoid traffic congestion. The most common age group affected in this study was between 16 to 45 years. This situation is worrying as more young population who are the backbone of the economy of the country , affected by drug abuse. From our study also, we found that there was quite a number motorcyclist (29 cases) involved in RTC were drug abusers. They may not only cause a hazard to themselves but also to other road users.

In our study, the Spearman Correlation statistical test resulted in a negative relationship between the type of cases and positive DoA results. This is due to many factors. One of them is in regards to the metabolism and pathophysiology of DoA. There is short-term effect and long-term effect of DoA. The effect of the drug might still persist even in the absence

Table I: Numbers of RTC deaths associated with DoA by Age

Age (years)	Motorcyclist	Other Vehicle (eg: Car, Van, Bus, Lorry)
<16	0	0
16 - 45	20	0
>45	9	
Total	29	0

Table II: Toxicology results based on type of drugs and types of specimens

TYPE OF DRUGS	BLOOD TOXICOLOGY	URINE TOXICOLOGY
Stimulant	12	13
Opiates	17	15
Cannabis & Ketamine	4	4
Other Therapeutic Drugs	53	29

Table III: Spearman Correlation between type of cases and positive DoA results

	Symmetric Measures				
		Value	Asymp. Std. Errora	Approx. Tb	Approx. Sig.
Interval by Interval	Pearson's R	-.060	.022	-2.491	.013c
Ordinal by Ordinal	Spearman Correlation	-.060	.022	-2.491	.013c
N of Valid Cases		1723			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

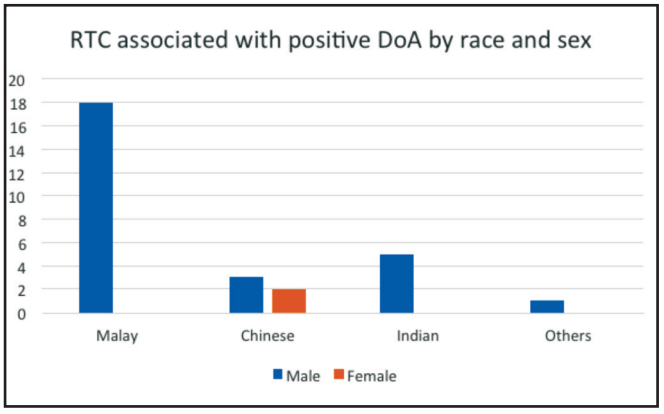

Fig. 1: Numbers of RTC deaths associated with DoA by Sex and Race.

the drug in the body. For example, the autonomic disturbance caused by cocaine can increase the heart rate and arrhythmias.[6] This can impair the ability to drive and cause RTC. Therefore, in these types of cases, the toxicology will be negative. In 5 cases, we found the presence of alcohol in the blood or urine samples in addition to DoA. It is important to note that alcohol can attenuate the effect of DoA.[7] Therefore, a small dose of DoA combined with alcohol will have a higher effect.[8,9]

During our study also, we noted there were several cases positive for lidocaine, quinolones and paracetamol. It was difficult for us to categorise these three drugs either in DoA or therapeutic drugs. There were cases reported that lidocaine, quinolones and paracetamol used as adulterant.[10] Lidocaine had been used as an adulterant for cocaine. Although we were certain that some of the cases died at the scene and not resuscitated at that time, we weren't sure about their previous medical history as limited information only available from the post mortem reports. Adulterant usually stays longer in the body and that is the reason why it can be detected in blood or urine even though the DoA is absent. If these cases were included in DoA, the cases, therefore, the number of positive cases will be higher.

On the other hand, the effect of DoA doesn't only affect the driver but also the other road users. In this study, we could not capture the RTC deaths caused by other road users who were influenced by drugs. It is a point to emphasise that some RTC deaths might be directly or indirectly caused by the other road users under the influence of DoA. The recklessness of the drivers under DoA may cause harm to another road user and might lead to death.

In conclusion, this study highlights the role of DoA in RTC death cases. This study might not reflect the true association of DoA in RTC. However, this study could initiate several parties responsible for managing RTC to carry out an extensive investigation and improve legislation to eliminate DoA in the future. The role of Forensic pathologist is not only confined in conducting post mortem and giving expert witness but also can be applied to prevent future mishaps.

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