A SURVEY ON VEHICLE REGISTRATION CODE: ASSOCIATION BETWEEN ON-THE-ROAD POPULATION AND THEIR VEHICLE REGISTRATION STATES

Khai Lee[a], Poh Ying Lim[b], Kah Haw Chang[a], Saiful Fazamil Mohd Ali[c], Ahmad Fahmi Lim Abdullah[a*]

[a] *Forensic Science Programme, School of Health Sciences, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan.*
[b] *Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor.*
[c] *Criminalistic Section, Forensic Division, Department of Chemistry, Jalan Sultan, 46661 Petaling Jaya.*

[*] *Forensic Science Programme, School of Health Sciences, Universiti Sains Malaysia, 16150 Kubang Kerian, Kelantan; Email: fahmilim@usm.my*

ABSTRACT: Every registered vehicle in Malaysia has a specific vehicle registration code consisting of alphabets and numbers displayed on the front and rear part of the vehicle. Whenever there is an incident related to a particular vehicle, this registration code can be used to retrieve information about the vehicle based on the data in the registry maintained by Malaysian Road Transport Department. The information can subsequently assist in tracing the motor vehicle and its owner or to assess witness's statement. However, our current vehicle registration system in Malaysia that uses alphabets to represent different territories or states could raise difficulties during an investigation especially if the registration number on the car plate could not be identified confidently by a witness whether or not the registration code in questioned could have from a particular state and involved in the incident under investigation. Therefore, the distribution of car registration code in Kelantan state was investigated, aiming to estimate the frequency of locally registered vehicle compared to those registered in other states of Malaysia as indicated by the alphabets. In this study, two car parking areas, one designated for general public and the other for university staff, were chosen (n=1000), surveyed and statistically analysed. Frequency and percentage in term of state of registration reflected by the initial alphabet for respective car parks were evaluated. Pearson's Chi Square ($\chi 2$) test was used to investigate if there is association between the two car parks based on plate numbers with "D" which indicate those cars registered in Kelantan, and cars with non-"D" plates that pertain to the other states. Our study shows higher percentage of vehicles carrying "D" (515, 51.5%) and "W" (234, 23.4%) plates in the study area. Statistical test suggests no significant association between the two car parks and "D" plated cars (p-value=0.067, >0.05), supporting the claim that the majority of the residents own cars registered in Kelantan state, regardless of their state of origin. For forensic intelligence, information from this study could strengthen the probative opinion and forensic significance when exploring information based on vehicle registration code, particularly in cases involving vehicles.

Keywords: Vehicle registration number, survey, frequency distribution, Pearson's Chi Square Test.

Introduction

Motor vehicle plays important roles for transporting people or goods in modern life. Amongst, cars provide the most common mean of transportation to commute and move from one place to another. In areas having limited convenient access to the public transportation such as train and bus, and particularly the case in suburban areas, cars have become a necessity to road users [1] as well as to represent the status and the sense of autonomy for some people [2-3]. The national car projects of Malaysia, including the Proton and the Perodua, offer affordable cars for domestic use and have played an important role in the drastic motor vehicle growth in Malaysia [4]. Up to July 2017, the number of vehicles on the roads in Malaysia had increased drastically and hit 28.2 million units with 47.2% of them being the private cars [5]. In the Federal Territories, including Kuala Lumpur, Putrajaya and Labuan, about 200,000 cars were registered new compared to the previous year, accounting for 22.4% of the latest on-the-road population in Malaysia. Amongst, those being registered in the state of Kelantan were accounted for only 3.2% of total registered cars in Malaysia as compared to other states such as Johor (12.8%), Selangor (10.3%), Penang (9.4%) and Perak (8.0%). These figures could be closely related to the growth rate and population density of the respective states [6].

For administration purposes, the State Road Transport Department uses an alphabet to code a vehicle registered in a particular state or federal territory. For example, a car plate started with alphabet "A" is registered at the state of Perak, while the alphabet "B" indicates Selangor, "C" indicates Pahang while "D" indicates Kelantan. Numerical sequence from 1 to 9999 is then used to form the plate number. Note that the term "vehicle registration code" was used in this study instead of the plate number of a car due to the combination of alphabets and numbers. This unique "code" of a vehicle could provide lead to its owner in cases involving hit-and-run accident, robbery or break-in [7] if the codes were noticed by the witness or recorded by a closed-circuit television (CCTV) or even by a car camera recorder. Using this code, information about vehicle owner, place of vehicle registration, model, type, made and colour of the vehicle can be retrieved from car registry database [8], particularly via the online-based Vehicle Ownership Certificate (VOC) system in Malaysia [9].

Accidents or crimes often happen very quickly that neither allow for a witness to respond nor notice detailed information including the vehicle registration code. A witness may not able to fully recall the code, but partially remembered code could be more easily noticed and memorised than other details during the incident, such as the appearance of a suspect [10]. Unfortunately, a painstaking investigative effort is required to determine the identity of a vehicle based on a combination of alphabets and numbers from an eye-witness' testimony. One important question to ask will be "Is the vehicle registered in a particular state, being used in that particular area only, given that they are over 18.6 million cars commuting on Malaysian roads daily?" [11]. In other words, how frequent is a random car on the road of a particular state carries a registration code of that state? Does a driver from other state prefer to use a car registered in his/her home state? When he/she has to work cross state?

In view of this, vehicle registration code with the respective alphabetical code in a particular area worth further investigation to evaluate the frequency of locally registered vehicle compared to those registered in other states of Malaysia. In the context of statistics, this information is important to understand the car usage of local residents, as well as the preferences of alphabetical code of local residents and workers from other states. The study on vehicle registration code in Kelantan state could then provide a snapshot of car registration code distribution in a particular state and thus serving as an initial data that allow the investigative office to assess evidential value of the information given by a witness and to assist forensic intelligence in tracing the vehicle involved. It also helps investigators to make decision whether or not an investigation should be done locally or nationwide, in order to trace a vehicle with an identified alphabetical code [12]. In this study, two car parking areas were chosen, one representing the general population of Kelantan state while the other representing population from different states of Malaysia working in a university, and the distribution of alphabetical code of cars located in these parking areas was subsequently surveyed and statistically analysed.

Methodology

Collection of Vehicle Registration Code

Two car parking areas in Health Campus of University Sains Malaysia, Kelantan, Malaysia, namely the public car park and staff car park, were chosen. The Health Campus has three faculties, a research institute and a teaching Hospital with a total number of about 5000 staff, excluding the students. Note that the public car park was mainly used by the public who visit the university hospital for healthcare services, while staff car park was specfically allocated for university staff who hold permits to enter the premise.

Vehicle registration code of 500 cars from the respective car parking areas were recorded with their first alphabet of the cars plates, indicating the states where a car was registered, i.e. A (Perak state), B (Selangor state), C (Pahang state), D (Kelantan state), J (Johor state), K (Kedah state), L (Federal Territory of Labuan), M (Melaka state), N (Negeri Sembilan state), P (Penang state), Q (Sarawak state), R (Perlis state), S (Sabah state), T (Terengganu state), W (Federal Territory of Kuala Lumpur) and PUTRAJAYA (Federal Territory of Putrajaya). On one random day, all cars parked in the respective car park were surveyed until 500 cars were reached. Each car was observed for its registration code and subsequently recorded on paper. Note that the data was collected on a working day to ensure that the staff car park was occupied by the cars of the university staff. All recorded entries were tabulated and subjected to statistical analysis.

Statistical Analysis

Descriptive analysis was conducted using IBM SPSS Statistics Version 24.0 [13]. Frequency and percentage of alphabetical code for respective public car park and staff car park were demonstrated. Pearson's Chi Square ($\chi 2$) test was performed using the software to investigate if there is association between the two car parking areas on

the basis of "D"-plate cars, *i.e.* registered in Kelantan state where the survey was conducted. This study hypothesised that "D"-plate cars will demonstrate higher frequency in public car park. A *p*-value of <0.05 was considered as statistically significant.

Results and Discussion

Distribution of vehicle plate number at car parks in USM

In this survey, a total of 1000 cars from public car park and staff car park were sampled and their alphabetical code were broken down into 16 categories according to their first alphabet of the car plates. Figure 1 displays the frequency and percentage of car distribution in two different car parking areas in the study.

At a glance, a total of about 75% of the vehicle registration code is either "D" or "W". Of these, a total of more than half (51.5%) were registered in Kelantan, followed by Kuala Lumpur (23.4%). Codes under the alphabet of other states were recorded at a much lower frequency, with less than 5.0% for each related alphabet, respectively. In Figure 1, two pie charts i.e. a primary and a secondary pie charts, are used to represent the frequency and percentage of car distribution of all registration codes observed at respective car parks. The secondary pie chart demonstrates the details of a portion of the primary pie chart, where the registration codes with relatively lower frequency are also noted.

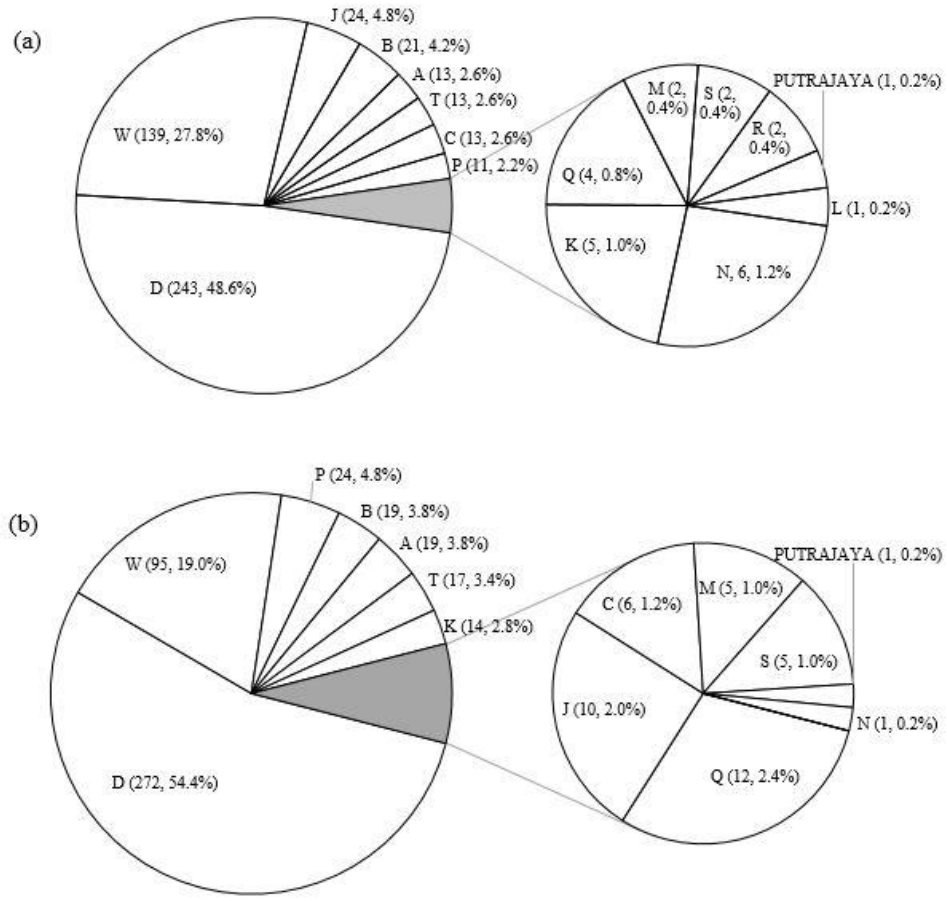

Figure 1: Frequency and percentage of car registration code distribution by state of registration in (a) public car park and (b) staff car park.

Examination of the data obtained from car parking area for university staff shows that cars registered in Kelantan (D) and Kuala Lumpur (W) are the most frequently reported. It was initially hypothesised that while a significant portion of the staffs of the campus are originating from other states of Malaysia Federation, the "D" population should be lower than that of the public car park. A non-Kelantanese might have registered his/her transports at the home states and used in Kelantan. To establish whether or not there is association between car parks and cars started with "D"-plate

and non- "D" plate, a Pearson's Chi Square test with recorded data as tabulated into 2×2 contingency table (Table 1), with group (public car park and staff car park) and outcome (vehicles with "D"-plate and others) was performed. At the significance level of α= 0.05, and degree of freedom, df= 1, the result shows that there was no statistically significant association between car parks and the presence of vehicles with "D"-plate (*p*-value= 0.067).

Table 1: Association between car park and vehicle with "D"-plate

Variable	Vehicle Plate, frequency (%)		χ^2 (df)	*p*-value*
	"D"-Plate	Others		
Car Park			3.367 (1)	0.067
Public	243 (48.6)	257 (51.4)		
Staff	272 (54.4)	228 (45.6)		

***** Pearson's Chi Square test was used.

The results suggest that the origin of a current resident in a particular state might not be significantly associated with the choice of vehicle registration code. A local Kelantanese who works in Kelantan does not necessary drive a locally registered car carrying a "D"-plate, whereas a non-Kelantanese who works in Kelantan is also likely to drive a locally registered car. A non-Kelantanese could also have owned a car during the period of working in Kelantan state, and this could have contributed to the observed high percentage of Kelantan registered car in the staff parking area.

In general, a large proportion of car population (48.6% – 54.4%) are locally registered car, either by the local resident or people originated from other states. The cars registered with Federal Territory of Kuala Lumpur ("W") formed about one quarter of the total distribution, partly due to the preference of new car owner since the choice of vehicle registration code could be highly influenced by the selection of preferred number [14], instead of the alphabet. This was supported by the proposed price for the special number, and in many instances which have to go through bidding procedure. Besides newly registered cars, the availability of post-registered or used car carrying a "W"-plate could also be a contributing factor, since "W"-car has the highest number in Malaysia as indicated by its running alphabets. Unfortunately, our research design does not allow for the determination of whether the observed car with "W" was a post-registered or newly registered car.

Vehicle registration code recognition system recording the particulars of a vehicle is generally applied in transportation system to increase the management efficiency, traffic efficiency as well as the traffic security, including entrance admission, security, parking control, road traffic control and speed control [7,14]). There is an available centralised computer system by Malaysian Road Transport Department that allows a car buyer to track the latest running alphabets and numbers. The implementation of borderless computerised vehicle registration system nationwide recently enables a car buyer to obtain his/her preferred registration code without the need to travel to the respective State Road Transport Department [15]. The official records of registered vehicle in one state therefore may not accurately reflect the actual on-the-road vehicles especially with convenient inter-state transportation connection [6], which was supported by the findings of this study.

In this study, the public car park in a hospital was used to represent the Kelantan residence as it appears to the key medical centre for Kelantan residence to seek medical services and to visit friends or relatives, thus, arbitrarily, it is best representing vehicle population in Kelantan. Nonetheless, further exploration of vehicle registration code survey is necessary to compare the data between different car parking areas for more meaningful findings. For forensic intelligence purpose, cases involving vehicle registration code shall needs greater investigative efforts if only partial registration code was available due to the distribution of car population from many states in a particular area. As Malaysian roadway is freely connected, it would be interesting if a nationwide vehicle registration code survey could be conducted at other regions or states of the country for further data comparison to also investigate their dynamic distribution and possible usage of the vehicle throughout the country.

Conclusion

The frequency of car plate alphabet survey on two parking areas provided a snapshot on the occurrence of cars registered based on state code. Through the survey, "D"-plate topped the frequency among 1000 random cars from two parking areas, indicating the priority choice of car owners to locally register their cars or used a locally registered car. The relatively high frequency of "W"-plate observed could be contributed by the availability of post registered "W"-cars in the market as well as cross-states registration practice. The statistical test shows that there is no association between two groups of population, namely the "D"-

plate and the non-"D" plate, with the choice of vehicle registration number. For forensic intelligence, information from this study could assist in giving probative opinion and the forensic significance of vehicle registration code exploration, particularly in cases involving hit-and-run where limited information can be retrieved from witness statement or car plate information.

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