ORIGINAL ARTICLE

Car Users' Knowledge & Practices on Tyre Maintenance in Malaysia

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ABSTRACT

Despite being one of the main issues in automotive consumerism in Malaysia, the importance of tyre in terms of knowledge and maintenance among users are still in doubt. It can be seen that many related tyre faulty crashes have occurred in recent years. This study aims to identify and understand car users' knowledge and practices on tyre maintenance in Malaysia. Data collection were done among car users in Klang Valley and 247 valid responses were analysed. The results indicate that users still lack in knowledge regarding tyre specifications and details. As for the maintenance, most of the users did practice recommendations accordingly with the tyre manufacturer. Apart from that, half of the respondents never check their spare tyre's condition and a few suggested that they have no idea about presence of spare tyre in their car. To conclude, users are still lacking in knowledge regarding tyre maintenance in terms of its specifications and ideal practices. Thus, it is recommended that users to be more aware and practice a proper tyre maintenance while ensuring their tyres are always in good condition so that may, perhaps, reduce the possibility to involve in a tyre failure related crashes.

Keywords: *tyre maintenance, automotive consumerism, road safety*

INTRODUCTION

Tyre is generally known as the main medium for a road vehicle to move and manoeuver on the road. It is actually designed with certain characteristics whereby it should be able to withstand the vehicle load and forces acting on it (e.g. reaction, braking force), provide traction and also absorb road shocks through damping system. Thus, tyres are always one of the most important parts in road vehicles (Bueno-López, Cardenal, Deibe, & García de Jalón, 2018).

Tyres are also the only element of vehicle that touch the ground and in contact with the road (RoSPA, 2018); which means that tyres are too exposed and more prone to the risk of faulty since it can hit anything on the road that may be hazardous. Thus, that is the reason why most insurance companies do not cover anything specifically related to tyre. Furthermore, based on authors' preliminary research through online searching, it was found that only Mercedes-Benz Services Malaysia have offered some sort of protection for tyres and rims (Tan, 2017). Regardless, this explains how important it is for users to maintain the tyres regularly in order to ensure safety while travelling on the road.

Users' knowledge and practices on tyre maintenance has always been a big concern. It is known that drivers usually check their tyres only when they notice unusual tyre performance (Chen & Yeh, 2018). Improper tyre maintenance practices in terms of tyre inflation, tyre and tread condition may result in tyre failure crashes. A study by Abdul Khalid et al. (2018) found that, in 2017, 43% of private vehicle users in Malaysia were forced to stop their vehicles on the road due to tyre faulty. Furthermore, it was reported that 3% of total investigated road crashes in Malaysia were caused by tyre failure (RSD, 2014) which shows that tyre has been one of the major issues of road vehicles.

In addition, lack of knowledge regarding maintenance may lead to victimization of fraud cases due to poor maintenance attitude (Mohd Jawi et al., 2017). It was reported by Abdul Wahab et al. (2017) that complaints on motor vehicles workshop are increasing along the years and were in the top ten on the list of complaints every month in 2016. Furthermore, based on the records by National Consumer Complaints Centre (NCCC), there were 1,572 reported cases that are related to automobile workshops whereby 5.3% of the total cases were related to fake or substandard auto parts (Abdul Wahab et al., 2017). It can also be observed that many of general workshops sold used old tyres without considering its conditions. In fact, some general workshops were found to have sold fake re-tread tyres and nock (re-grooved) tyres. Without proper understanding and knowledge, users may easily be cheated by workshops.

A study by Ratrout (2005) found that 21% of the inspected vehicle tyres, were under-inflated which was obviously shown from the type of defects and wear found at the tyres during inspection. Furthermore, only 23% respondents know the ideal tyre pressure for their own vehicle indicating that

drivers in Saudi Arabia need proper education in terms of tyre maintenance.

However, study with regards to tyre maintenance has never been conducted in Malaysia despite tyre issues being considered as one of the major issues. While tyre failure crashes are well known by vehicle users, such proper maintenance knowledge and practices are still questionable. Therefore, this study aims to identify and understand cars users' knowledge and practices on tyre maintenance in Malaysia.

Preliminary Study on News Report Analysis

A preliminary study has been conducted by the authors through online searches regarding tyre issues in Malaysia. Google search engine was used to search for any news and articles related to tyre issues in Malaysia for the last 5 years; from 2012 until 2017 and the articles were selected by the authors based on its originality and relevance to issues. 64 valid online news from local newspaper and trusted articles were collected, analysed and referred.

There were two major issues found: tyre maintenance knowledge and practices as well as behaviour issues and incidents related to tyre failure on the road issue. Users' understanding and behaviour towards vehicle maintenance are questionable as not every vehicle users has strong knowledge in automotive maintenance especially in terms of technical parts (Abdul Wahab et al., 2017). Some of them only rely on the information reported by the mechanics from the service centre or workshops. Thus, it shows why fraud cases, fake tyres and spare parts were among highly reported issues found during the online searches and the results are as illustrated in **Figure 1**.

From the analysis result, it can be seen that 50% of reported news and articles with regards to tyre issues are fraud cases from general workshops. Inability to define the authenticity of tyres, understand the tyre's specifications, details and symbols stamped on tyre may be the reason why users tend to be the victims of fraud cases in workshops.

The other 50% is from the combination of users' behaviour or discipline. Poor tyre selections, oversized and camber modification of tyre rims, fake and illegal nock tyres are the common issues that can be found in Malaysia while other 22% reported to experience broken and faulty tyres due to improper maintenance of their tyres. It can be explained that users still lack in knowledge about tyre maintenance and practices thus may be the reason why they behave unwell in terms of tyre maintenance and selection.

Improper tyre maintenance practices may lead to tyre failure and thus may lead to road crashes. It was found that plenty of local newspaper articles reporting incidents related to tyre failure on the road. **Figure 2** shows the compilation of several local newspaper articles reports on crashes due to tyre failure.

To make it worse, there are also reported news regarding fatal crashes occurred involving a user who was in the middle of changing his faulty tyre on road side. These type of fatal crashes are avoidable or perhaps, reduced, if proper tyre maintenance practices are applied. Therefore, it shows why good practice in tyre maintenance is required to maintain the vehicle roadworthiness and avoid any possible crashes from tyre faulty.

From the preliminary study, it can be concluded that tyre issues have always been one of the main issues in automotive area. Poor knowledge, practices and attitude in tyre maintenance has led to poor maintenance practice and caused tyre failure-related road crashes. Therefore, the results from this preliminary study are used by the author as the basis to conduct further study in understanding the users' knowledge and practices on tyre maintenance.

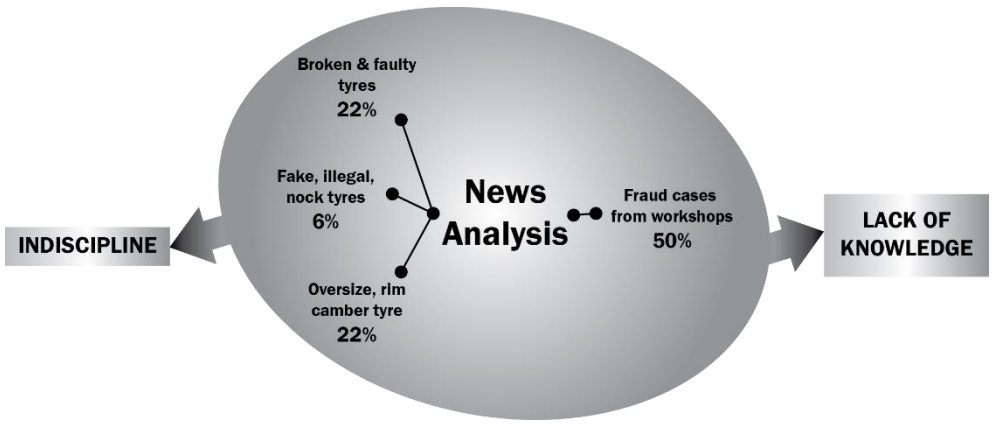

Figure 1 News analysis on tyre issues in Malaysia done by the authors.

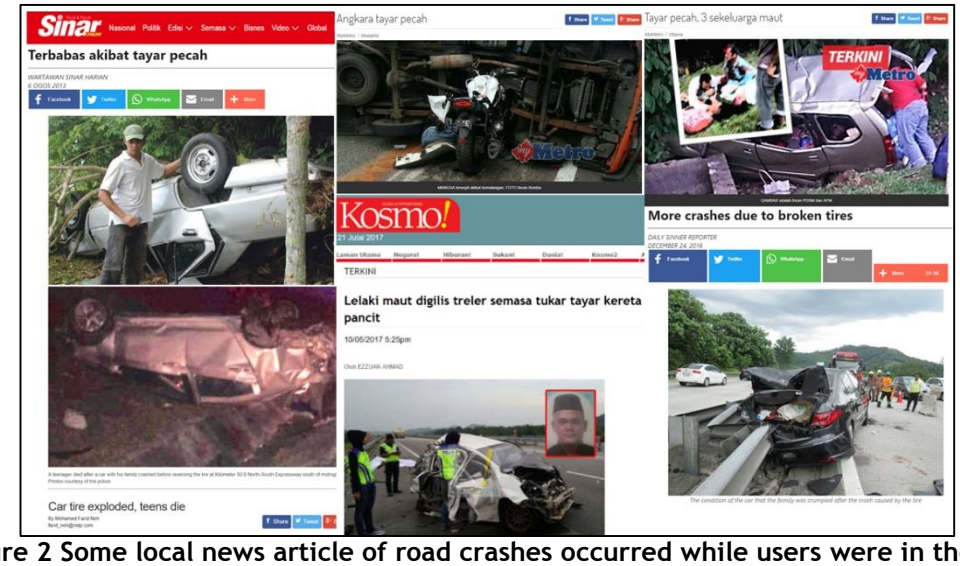

Figure 2 Some local news article of road crashes occurred while users were in the middle of changing their faulty tyre.

Scope of Study

This study is a continuation from the work of Mohd Jawi et al. (2017) which focuses on the automotive consumerism and road safety in Malaysia. The scope of this study is adapted from Abdul Khalid et al. (2018) whereby it covers the pre-crash event based on a familiar road safety concept by Haddon (1999) under the role of users in vehicle ownerships as described by Mohd Jawi et al. (2012) as illustrated in **Figure 3** . This study also focuses only to car users commuting within Klang Valley area as described by Mohd Jawi et al. (2017).

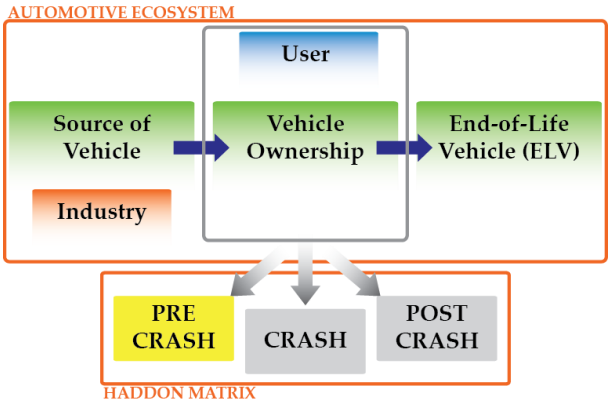

Figure 3 Scope of this study (in yellow) adapted from Abdul Khalid et al. (2018).

METHODS

Method Description & Survey Instruments

This study employed two methods inspired by the work of Ratrout (2005), whereby it includes interview and physical checking as described in **Figure 4**.

The interview session was done by asking respondents several questions constructed using semi-structured questionnaire which includes demographic profiles, tyre maintenance knowledge and practices. As for the second session, physical checking was done on respondents' car tyres to check their tyre status in terms of the pressure, tread depth and condition, spare tyre pressure and condition. The assessment was done using pressure gauge measurement, tread depth measurement and other related instruments and data were recorded.

Sampling

A multi-stage sampling includes stratified and convenient sampling were employed in this study. Sample size initial target was determined from Krejcie & Morgan (1970) whereby at least 384 respondents are required to be assessed. However, due to several constraints and limitations, we only managed to collect 256 responses.

Data Collection & Tabulation

Prior to data collection, pilot test was done among authors and a few public respondents to test and ensure the developed questions and methods were acceptable and able to capture the required data in order to achieve the objective of the study. Data collection was done at multiple locations around Klang Valley area. Public places (shopping malls, petrol stations, shop lots), offices or factories and schools were among the selected locations where the respondents were among the public people, workers and school teachers. All the collected data were analysed and presented using Statistical Package for Social Science (SPSS) for descriptive analysis and tabulation and Microsoft Excel for graphical presentation.

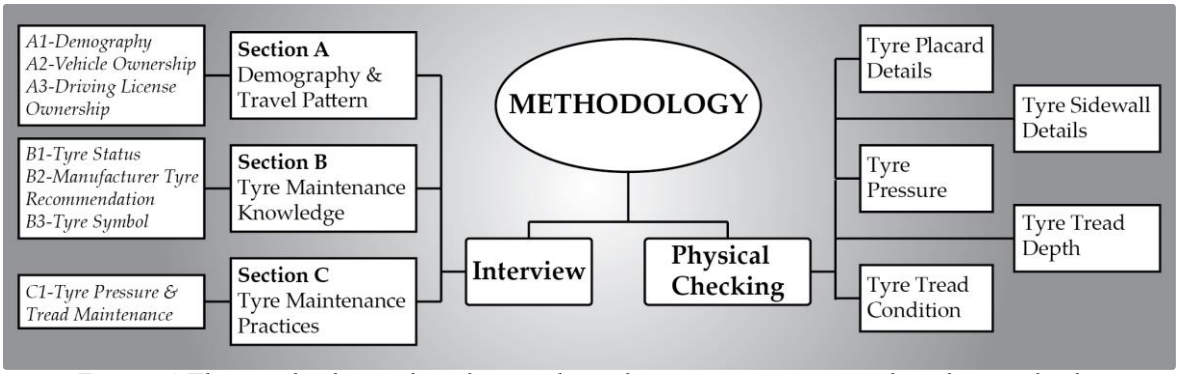

Figure 4 The methods used in this study and instruments covered in the methods.

RESULTS

Demographic Profile

A total of 256 responses were successfully collected throughout the data collection. The analysed responses were however, dropped to only 247 due to some irrelevant and inaccurate answers from respondents. Table 1 represents the demographic profile of all respondents. Mean for respondents' age is 33.07 with standard deviation value of 9.01. The age range of respondents is from 21 to 76 years old (mode = 26, N = 13.4%). Malay respondents (86.6%) are the majority group with male and female make up almost equal percentages (50.2% of male and 49.8 for female).

Furthermore, 51% of respondents are degree holder with the majority of them are working in private sector (56.3%) and government sector (31.6%) and having a monthly income range of RM2001 – 5000 for both own (60.7%) and household (44.5%) incomes. National car makers were the main vehicle used by majority of the respondents; Perodua owned by 37.2% and Proton owned by 27.1% of the respondents, followed by another 27.5% comprising a combination of the "Big 3" car manufacturers (Honda-Toyota-Nissan) (Mohd Jawi et al., 2017). On the other hand, 39.3% of respondents use a 2011–2015 manufactured year car as their favourite commuting cars and most of them own driving licenses in 2001–2010 (49.8%).

Knowledge on Tyre Maintenance

In the interview sessions, several questions with regards to users' knowledge, were asked to respondents in order to assess their level of understanding on tyre maintenance. The results were tabulated in **Table 2.**

First question was regarding the responsibility in terms of car maintenance and it shows that 75.7% of respondents maintain their cars on their own and 17.4% requires their spouses' assistance to do maintenance and the remaining were families and others. Out of 17.4% respondents

who require spouse to do the maintenance, 90% of them were female which explained that female users are more depending on their husband in regards to car services and maintenance. This may due to the nature of society whereby males are regarded to possess higher awareness in automotive-related subjects than female.

Respondents were then asked on their knowledge in regards to their car tyre details: whether or not they know their tyre manufacturing date, tyre size and recommended size by manufacturer. The results were also tabulated in **Table 2**. It can be seen that only 17.6% respondents know their tyre manufacturing date. On the other hand, 37.6% of them know their current tyre size while only 29.4% of them know the recommended tyre size for their cars. This explained that users lack the knowledge or are unaware about their car tyre details and specifications.

Before the physical checking session started, the respondents were asked to answer five pictorial questions regarding symbols on tyre and other tyre specifications in order to assess their knowledge and understanding. The results were tabulated in **Table 3**.

It can be seen that 72.9% of respondents were familiar with the placard image. For tyre symbols, 47% of respondents did know the tyre width symbol, while 56.7% of them know the tyre diameter symbol and 52.2% are able to define the tyre manufacturing date symbol. Surprisingly, only 36.4% of them recognize and understand the standard compliance markings such as "E" and "MS" markings on the tyre, which is considered very low since Malaysian are supposed to be well-aware on "MS" symbol.

Nevertheless, the results show why users' knowledge on tyre maintenance is a big concern as almost 50% of the respondents do not understand and are unaware on symbols stamped on their tyres. This may lead to fraud cases and users may be easily cheated by the workshop workers due to their inability to define the correct sizes or the authenticity of the tyres.

Table 1. Overall demographic profile of respondents.

Description	Category	Frequency (N)	Percentage (%)
Age	18 – 30	123	49.8
	31 – 40	81	32.8
	41 – 50	28	11.3
	51 and above	15	6.1
Gender	Male	124	50.2
	Female	123	49.8
Races	Malay	214	86.6
	Chinese	13	5.3
	Indian	18	7.3
	Others	2	0.8
Education	Secondary School	25	10.1
	Diploma – STPM – A Level	71	28.7
	Degree	126	51.0
	Master – PhD	22	8.9
	Others	3	1.2
Occupation	Government	78	31.6
	Private	139	56.3
	Business	5	2.0
	Self Employed	5	2.0
	Students	12	4.9
	Retire	3	1.2
	Others	5	2.0
Monthly Income (Own) (RM)	2,000 and below	45	18.2
	2001 – 5000	150	60.7
	5001 – 8000	43	17.4
	8001 – 12000	7	2.8
	12000 and above	2	0.8
Monthly Income (Household) (RM)	2,000 and below	29	11.7
	2001 – 5000	110	44.5
	5001 – 8000	57	23.1
	8001 – 12000	29	11.7
	12000 and above	22	8.9
Car Manufacturer (Respondents Main Vehicle)	Perodua	92	37.2
	Proton	67	27.1
	"Big 3"	68	27.5
	Others	20	8.1
Car Year of Manufactured (Year)	1991 – 2000	16	6.5
	2001 – 2010	64	25.9
	2011 – 2015	97	39.3
	2015 and after	55	22.3
	Unsure	15	6.1
Driving License Ownership (Year)	1990 and before	15	6.1
	1991 – 2000	39	15.8
	2001 – 2010	123	49.8
	2011 – 2015	57	23.1
	2015 and after	13	5.3

Table 2. Tyre maintenance knowledge among respondents.

No	Category & Description	Results			
1	Maintenance responsibility (as declared) **(N = 247)**	Own	Spouse	Parents/ Siblings	Others
		75.7%	**17.4%**	**5.7%**	**1.2%**
2	Maintenance responsibility (Spouse) **N = 43**	Male depending on wife		Female depending on husband	
		9.3%		**90.7%**	
3	Knowledge on tyre manufacturing date **(N = 247)**	Yes		No	
		17.6%		**82.4%**	
4	Knowledge on tyre size used **(N = 247)**	Yes		No	
		37.6%		**62.4%**	
5	Knowledge on tyre size recommended by manufacture **(N = 247)**	Yes		No	
		29.4%		**70.6%**	

Table 3. Respondents answers on pictorial question of tyre symbols.

Image Question	Placard	Tyre Width	Tyre Diameter	Tyre Manufacturing Date	Standard Markings
Answers					
Correct	**72.9%**	**47.0%**	**56.7%**	**52.2%**	**36.4%**
Incorrect	**12.1%**	**27.5%**	**18.6%**	**13.8%**	**21.5%**
Not Sure	**15.0%**	**25.5%**	**24.7%**	**34.0%**	**42.1%**
Incorrect & Not Sure Combined	**27.1%**	**53.0%**	**43.3%**	**47.8%**	**63.6%**

Practices on Tyre Maintenance

A few questions with regards to user practices on tyre maintenance in terms of their method and frequency of checking their tyre while ensuring the roadworthiness of their cars, were asked during interview sessions. The results were tabulated in **Table 4**. The first question was regarding the method or reference on how respondents determine the correct air pressure to fill in to their car tyres. Majority of users refer the manufacturer placard that is usually located at the B-pillar or fuel tank of car. This is followed by referring to their past experience in which they only use the same air pressure they filled in previous or other vehicles.

On the second question, users were asked to describe on their method in measuring and checking their tyre tread depth and condition. Majority of them only do a very quick visual on their tyres weekly or monthly. Only 9.3% of them did check the Tread Wear Indicator (TWI) to accurately measure their tyre tread depth and condition. This explains how users did not properly care hence disregarding correct tyre maintenance.

Respondents were then asked about their frequency of filling air pressure to their car tyres and also frequency of checking their tyre tread depth and condition. Majority of them did fill in air pressure (71.2%) and check their tyre tread and condition (53.0%) at least once a month which is consistent with most of tyre manufacturer recommendation where it is essential to do a regular checking on vehicle

tyres at least once a month (Bridgestone, Continental, Dunlop, Goodyear, Michelin) in order to ensure maximum tyre life, its safety and roadworthiness.

In the final question, respondents were asked on how frequent they check and perform tyre alignment service. The result shows that majority of the respondents do the tyre alignment checking at least once per 6 months. It is understood that most of them did the alignment check during the periodic service due to normal periodic service schedule set by most of authorised service centre is approximately every 6 months.

During physical checking, several details in regards to tyre specifications were recorded and tabulated as **Table 5**. Tyre brand for all four tyres were observed and compared. It was found that 88% of respondents used the same brand for all their car tyres. Out of the 12% respondents who used different tyre brand, 78.6% were using different brand between front and rear tyres only. However, there was still 9.5% of the respondents used different tyre brands for all four tyres on their car. It is not recommended to use different tyre brands for all four tyres because different brands and model have different type of tread shape and thus, it may affect the tyre performances in terms of tread function ability.

A comparison on tyre manufacturing date between all tyres were also done during the physical checking and it was found that 74.5% of respondents have the same manufacturing date for all tyres. Whereas out of 25.5% of the respondents who used different tyre manufacturing date, 80% of them used different brand between front and rear tyres only. However, 6.7% of them was found to be using different tyre manufacturing date for all tyres. This may suggest that some of the car users will only change their tyres depending on tyre tread usage whichever wear out earlier.

In other observations, it was found that 33.2% of the respondents opt for bigger size tyres than what has been recommended by manufacturer. It is understood that they believe in using bigger tyres will provide more traction, stability and better performance (Mohd Jawi et al., 2017). Technically, bigger tyre size has higher weight which may results in heavier car, more traction and changing the car's centre of gravity. Heavier car with higher traction ability would require more power to manoeuvre and thus, will affect the car fuel economy. Bigger tyre size also has bigger diameter and thus, may as well, affect the revolution per minute of the tyre. In other cases, the change of tyre size may affect the motor vehicle's system certification, at least in braking performance (UN Regulation 13H) and speedometer accuracy (UN Regulations 29). Moreover, based on observation, usage of bigger tyre may reduce the comfortability of the driver and passenger beside possibly causing the tyre to touch other parts of vehicle body. Therefore, it is not recommended to use bigger tyre than the recommended size by manufacturer.

Tyre pressure for all inspected tyres were measured using digital pressure gauge, recorded and compared with the recommended pressure by manufacturer to determine the inflation level of the used tyres. The calculation was done based on study from (Ratrout, 2005) and taking into account a threshold of ±20% of recommended pressure. From the results, it was found that only 47.4% of respondents used properly inflated tyres on their cars. 35.4% of them however, were driving on an under-inflated tyres while the remaining were over-inflated. It was also found that most of the under-inflated tyres were applied by the users who determine their correct air pressure simply from previous experience. There were also users who refer placard for determining correct air pressure yet still have their tyres under-inflated or over-inflated. This is mainly due to filling in the air pressure not at cold temperature or they may not know that the recommended tyre pressure displayed in the placard is cold tyre pressure. It is dangerous to drive in an over and under-inflated tyres as it may lead to skidding due to less traction and reduce its handling capability. Under-inflated tyres also may result in extra fuel consumption, excessive and imbalance tyre wear and thus reducing its life span (Kubba & Jiang, 2014).

On the other hand, tyre tread depth also has been observed and measured using digital tread depth measurement device and recorded as shown in the Table 5. The result shows that majority of respondents were using tyres with a tread depth of 6-8mm. However, there were a few respondents who used tyre with tread depth of 1-3mm.

Table 4. Tyre maintenance practices among respondents.

No	Category & Description	Results					
1	Reference to determine the correct air pressure	Placard	Experience	Families/ Friends	Mechanic	Do Not Know	Others
	(N = 247)	**42.9%**	**36.4%**	**3.2%**	**2.8%**	**7.7%**	**6.8%**
2	Ways to measure and check the tyre tread depth and condition	Quick visual	Check TWI	Use Coins	Mechanics	Do Not Know	Others
	(N = 247)	**55.9%**	**9.3%**	**4.9%**	**6.9%**	**12.6%**	**10.6%**
3	Frequency of filling air pressure to tyres	Once a month	Once per 6 months	Once a year	Never	Others	
	(N = 247)	**71.2%**	**15.0%**	**1.6%**	**7.3%**	**4.9%**	
4	Frequency of checking tyre tread depth and conditions	Once a month	Once per 6 months	Once a year	Never	Others	
	(N = 247)	**53.0%**	**27.1%**	**4.0%**	**11.3%**	**4.5%**	
5	Frequency of checking and do tyre alignment	Once a month	Once per 6 months	Once a year	Never	Others	
	(N = 247)	**32.8%**	**36.0%**	**15.0%**	**10.1%**	**6.1%**	

Table 5. Inspected tyres' details and specifications.

No	Category & Description	Results			
1	Tyre brand: comparison between all tyres	Same		Different	
	(N = 247)	**88%**		**12%**	
2	Tyre brand differences	Different front vs rear	Different front, left vs right	Different rear, left vs right	Different all
	(N = 30)	**78.6%**	**4.8%**	**7.1%**	**9.5%**
3	Tyre manufacturing date: comparison between all tyres	Same		Different	
	(N = 247)	**74.5%**		**25.5%**	
4	Tyre manufacturing date differences	Different front vs rear	Different front, left vs right	Different rear, left vs right	Different all
	(N = 63)	**80%**	**6.7%**	**6.7%**	**6.7%**
5	Current tyre & rim size compared to recommended size by manufacturer	Same	Bigger	Smaller	
	(N = 247)	**63.2%**	**33.2%**	**3.6%**	
6	Tyre inflation level compared to recommended pressure by manufacturer	Properly Inflated	Over-Inflated	Under-Inflated	
	(N = 247)	**47.4%**	**17.2%**	**35.4%**	
7	Tyre tread depth measurement	1-3 mm	4-5 mm	6-8mm	
	(N = 247)	**8.7%**	**31.6%**	**59.7%**	
8	Tyre physical condition recorded	Fine	Normal Wear	Shoulder Wear	
	(N = 247)	**49%**	**23.1%**	**11.7%**	
		Centre Wear		Bald & Aging	
		7.3%		**8.7%**	
9	Spare tyre condition check	Yes		No	
	(N = 247)	**49.8%**		**50.2%**	

According to the chart by (etyres, 2018), tyre with a tread depth of 6-8mm is considered good tyre as the tyre only worn by approximately 30%. Whereas a tyre of 4-5mm tread depth also can be considered fine with approximately 60% worn. However, at tread depth of 3mm and below is considered to be dangerous and regular checking has to be done as it is almost 80% worn. While in the UK, it is illegal to use tyre with tread depth below 1.6mm with a fine and penalty of 2,500-pound sterling shall be charged to the offender. In addition, The Royal Society for the Prevention of Accidents (RoSPA) recommends that tyre has to be replaced when it is at or below 3mm tread depth due to safety precaution (RoSPA, 2005).

Tyre condition were also observed and recorded during the physical checking. It is found that 49% of the tyres were in fine condition while 23% were having a normal wear condition. However, some tyres were found to have a shoulder and centre wear and to make it worse, some did use bald and aging tyres. It is understood that the shoulder and centre wear tyres are due to over and under-inflated tyre condition while the bald and aging tyres were among the expired tyres which the tyres were above 6 years of usage (National Highway Traffic Safety Administration (NHTSA), 2007). According to Rules 105, Motor Vehicle (Construction & Use) Rules 1959, bald tyres that possibly will fail or cause harm on the road are illegal to be used on Motor Vehicle in Malaysia and a fine of not more than RM 2,000 or jail not more than 6 months or both may be charged to first time offenders, if the offenders being caught for 2nd time or more, he or she will be fined not more than RM 4,000 or jail not more than 12 months or both. According to Rules 30, Motor Vehicle (Construction & Use) Rules 1959 which refers to United Nations Regulation 30, 54, 108, 109, 75 and Malaysia Standard 1394, 149, 224; the tyre is considered bald when the tread depth is equal or lesser than 1.6mm or on most cases when the Tread Wear Indicator (TWI) on the tyre touch the ground.

A graph of tyre condition was plotted with the combination of tyre manufacturing date and tread depth condition in order to find the relationship between both variables towards tyre conditions and it is shown as **Figure 5.**

As seen in the figure, old or expired tyres are more likely to have a poor tread depth and condition. However, it can be denied that there were worn out tyres that are relatively new in terms of manufacturing date. It can be seen in the graph that almost 50% of worn out tyres manufactured on 2014 and above. It shows that age is not only the reason for worn out tyres but travelling pattern and distance also does play a big role.

At the end of all sessions, respondents were asked about their spare tyre and whether they do regular checking or not on its pressure and condition and is tabulated in **Table 5**. Surprisingly, half of the respondents admitted that they did not check their spare tyre. Some of them confessed they did not even know the existence of spare tyres and did not know where it is located. It is indeed, important to also check and maintain the spare tyre condition and ensure it is in good operating condition especially for long journeys as unfortunate occasions may happen during the journey. This also explained how users' knowledge and practices on tyre maintenance are in a big concern.

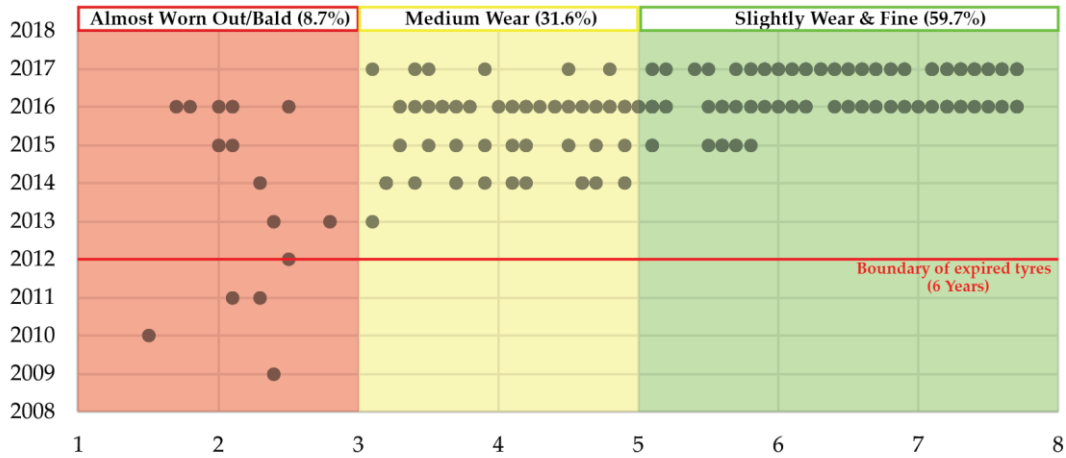

Figure 5. Graph of tyre manufacturing year against tread depth and tyre condition.

CONCLUSION

Users' knowledge and practices on tyre maintenance are still a big concern. It can be seen that almost 50% of respondents did not properly maintain and aware on their tyre conditions. Almost 50% have driven their cars with over and under-inflated tyres and 50% have never checked their spare tyre conditions.

The results indicate that users require more understanding on tyre maintenance. Educational programs and awareness campaign in terms of good practices on tyre maintenance are needed in order for them to be more aware and cautious on their tyre condition. Proper education also may help users to be more disciplined and wiser in choosing better and correct tyre type and size.

It is important for users to gain more knowledge and understand their tyre details and specifications especially on the tyre markings. This may help to avoid fraud cases from happening and help users in choosing a suitable tyre for their car.

As for conclusion, it is important for car users to understand and practice regular maintenance not only on the car and its engine parts, but also on its tyres. In addition, it is also essential for users to ensure their tyres are in good and safe operating condition every time before they start driving while maintaining the car's roadworthiness and thus, may help to prevent crashes due to tyre failure from happening.

In addition, it is recommended that tyre maintenance knowledge and practices to be elaborated in more details in current Driving Education Curriculum (DEC) in Malaysia as it is found that this topic is less highlighted in the current DEC.

Furthermore, responsible parties should look into the feasibility ins making the usage of Tyre

Pressure Monitoring System (TPMS) to be mandatory for all registered vehicles in Malaysia as it may assist users in determining tyre conditions while driving and may help in preventing crashes due to tyre failure.

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COMPETING INTERESTS

There is no conflict of interest.

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