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TRAFFIC ANALYSIS OF WARSAK ROAD PESHAWAR PAKISTAN

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Abstract

This research paper represents traffic analysis of Warsak road Peshawar Pakistan. Inventory surveys including educational institute studies, traffic control devices,accident studies, speed studies, age effect on speed, parking studies,traffic volume studies were carried and the data was collected. Standard statistical expressions were used to calculate volume to capacity ratio of road. Data analysis yield that road is overloaded and is in category "F" of Indian Roads Congress (IRC) standards. On the basis of results and location of road, various suggestions and recommendations were given.

Keywords: Traffic analysis, Warsak road Peshawar Pakistan, Passenger car unit, Volume to capacity ratio.

I. INTRODUCTION

Traffic of a city affects all aspects of its citizen'seconomic and personal activities. At a general level, thetraffic problem is understood as a situation of mismatchbetween supply (i.e., roads and their capacity) and demands(i.e., travel needs). Whenever this mismatch increases, city administrators have tried to balance it by creatinginfrastructures (e.g., new roads, expanding capacity) orpolicy changes (e.g., banning traffic movement during majorgames)[1].

Pakistan's road condition is not different from all the developing countries. Major problem thatmotorists are facing onhighways are congestion, accidents,and costs. To manyautomobiles,trucks, buses, bicycles, and pedestrians are attempting to use the same space to reach their destiny.

Traffic management in Peshawar has been the city's main issue in the state. The public, private and government sectors lose a lot of time due to poor management of traffic in city.It often happens that lives are lost because of delays and accidents on the road due to poor traffic flow. This research is an effort to provide suggestion and recommendations to Inspector General Traffic police to enforce an efficient traffic flow system in Peshawar. A stretch of approximately 2 kilometers of Warsak Road, from the starting point at Saint Marry School is considered in this project.

One of the main reasons for selecting this stretch is that many educational institutes are located on the road which makes the roadway too much crowded during the peak hours.

Traffic management problems can be addressed by two ways. First one is to find the volume to capacity ratio of the road [2]. If the ratio is greater than one (01), it means road is compensating more volume of vehicles than capacity. Second method is to find Passenger car unit (P.C.U) in peak hour and then compare it with the standards [3]. In our research both methods are adopted and results are then compared with the standards.

II. METHODOLOGY

To collect data and find the prevailing condition of the road, several field visits were conducted. Detail of each visit is as follows.

A. Educational institute studies

Main cause of the congestion on the Warsak road is the abundance of educational institutes.It was necessary to conduct Educational institute survey to find the number of these institutes. Other factors that were to find include, transport system and parking facilities for the vehicles to pick and drop the students. After visiting each institute a list of schoolsand their vehicles was created. List is shown in fig.1

B. Traffic control devices

A detailed survey was conducted to find traffic control devices on the Warsak road.It was very surprising to see that there were only four sign boards on 2km stretch.Two of the sign boards were of U-turns, and the remaining two were showing maximum speed limit.There were 29 U-turns in 2 Km stretch. Out of these 29 U-turns only two turns were with sign boards.29 U-turns in 2 Km stretchmeans there was a U-tern every 51meter.

C. Accident studies

Accident studies were conducted onWarsak road. The record was taken from local Police station of Warsak Road with kindpermission of SHO. Given data is presented in fig.2

D. *Speed studies*

Keeping in mind the importance of speed studies, following two surveys were conducted on Warsak Road.

1) Spot speed
2) Age effect on Speed

1) Spot speed:

Spot speeds of the vehicles were calculated using two point methods [2]. Calculated vehicles were grouped on the basis of their speed. Observations made during the survey are presented in Table. 1. Using this data, collected from spot speed studies, 85^{th} percentile speed and frequency distribution graph were obtained[2]. These graphs are presented in fig.3 and fig.4.

School or College	No. of Busses
Iqra Rozat-ul-Atfal	22
Frontier Model School	09
Peshawar Model for Boys I	07
Peshawar Public	10
Khyber Grammar	09
Peshawar Model for Boys II	11
Peshawar Model for Girls	24
Peshawar Medical College	05
Warsak Model	17
City School	-
IIUI	-
The Educators	-

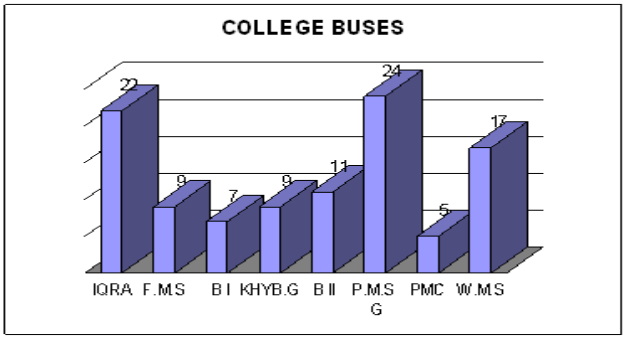

Fig.1 Educational Institute buses

2) Age effect on speed:

To find the effect of driver's age on the traffic, a survey was conducted. Result isgiven in figure 5.

E. Parking studies

It was necessary to conduct a detailed survey regarding the available parking facility on the Warsak road. It was found that only one plaza on the given stretch had a proper parking facility. Cars coming for other plazas were being parked on the road side. Most of the cars parked were for educational institutes i.e. to pick or drop students.Different purposes of parking observed are given in the figure 6.

F. Traffic volume studies

Traffic volume studies consist of the surveys to find the following

1. Hourly traffic
2. Peak hour traffic
3. Passenger car unit (PCU)

Due to lack of the suitable instrument, we adopted the manual method to find the hourly traffic[2].Data collected is presented in figure 7.

III. DATA COLLECTED

Data collected during different surveys is given below in the form of graphs and figures.

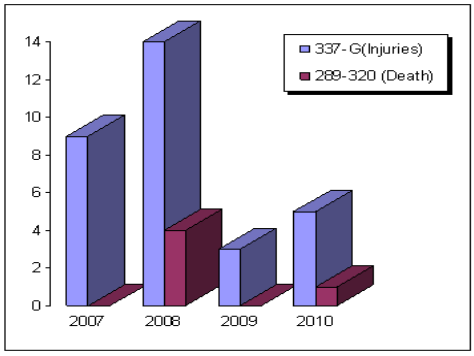

Fig.2 Accident studied record

Table 1 Spot speed data

Speed (Km/hr)	No. of vehicles
0 -10	09
10-20	17
20-30	51
30-40	31
40-50	17
50+	00

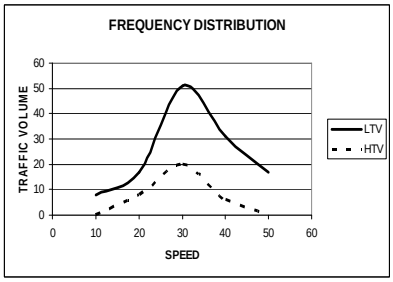

Fig.3 Frequency distribution curve

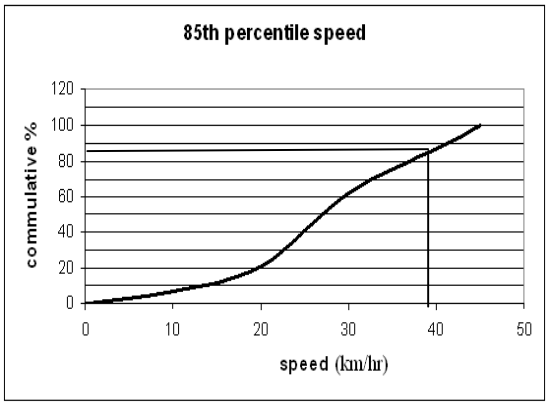

Fig.4 85th percentile speed

Fig.5 Age effect on speed

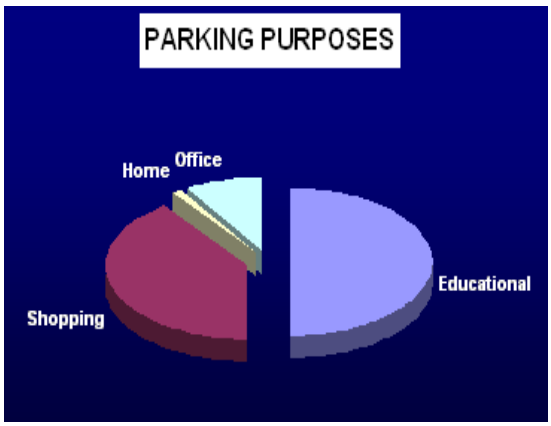

Fig.6 Parking purposes

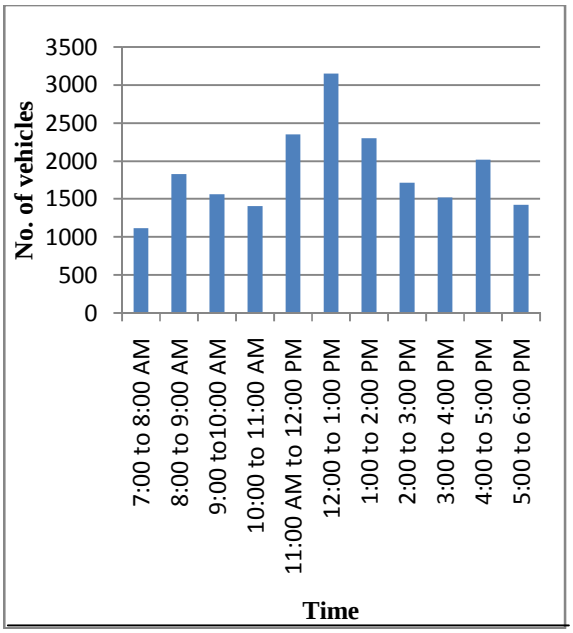

Fig.7 Hourly traffic volume

IV. DATA ANALYSIS AND RESULTS

A. Volume to capacity ratio

Data obtained from field was analyzed to get Volume to Capacity Ratio of Road. The basic equation to find the volume to capacity ratio is given byequation 1 [4].

$V/C = SF/ (C_i*N*F_w*F_p*F_{hv})$ ..... (Eq.1)

1) Service flow rate (SF):

Service flow rate is defined as the maximum 15 minute traffic volume expressed as hourly volume. Peak 15 minute traffic was 877, observed during 12:30p.m to 12:45 p.m. multiplying this with 4 gives us 3508. This is the maximum 15 minute flow expressed as hourly flow.So S_F = 3508.

2) Ideal capacity (C_i):

Ideal capacity is given by the highway capacity manual and is equal to 2000 passenger cars per lane per hour [5].

Ci = 2000 pc/ lane /hr

3) Number of lanes (N):

Number of lanes on one side of the road are 2.

N= 2

4) Adjustment factor for the restricted land width and side adjustment (F_w):

Basic and ideal capacity of the road is based on the assumption that at least 6ft lateral clearance is provided on either side of the road.On Warsak road lateral clearance is provided only on one side of the road. Hence

Fw = 0.81

5) Non-Regular driver Adjustment Factor (F_p):

F_p is a very abstract factor and depends on the skills of the driver.However, we found that most of the drivers observed during the survey were regular user of the road

F_p = 1.00

6) Heavy Vehicle Adjustment Factor (FHv):

Determining the adjustment factor for the presence of heavy vehicles is a two-step process:

- Finding the passenger-car equivalents for buses.

Number of buses observed, were 545 and total number of vehicle were 19950/day. So proportion of buses in total vehicles was calculated as follows

P_T = 545/19950 = 0.03

- Using these passenger-car equivalents and percentage of buses in total vehicles,Fhv can be calculated using follow equation.

$$f_{HV} = \frac{1}{1 + P_T(E_T - 1)}$$ ……. Eq. 2

Now putting the values in equation 2 heavy vehicles adjustment factor was calculated.

f_{HV} = 1÷ {1 + 0.03 (3 – 1)}

= 0.94

After determining all the inputs required for finding the V/C, we put all the values in equation 1 to get the result as below:

$V/C = S_F / (C_i*N*F_w*F_p*F_{hv})$

$$V/C = \frac{3508}{(2000*2*0.81*1.0*0.94)}$$

= 1.15

If we see table 2, roads having v/c ratio greater than 1 are put in category "F"according to the Indian Roads Congress (IRC).

Table 2 Acceptable limits of passenger car unit

L.O.S	Flow conditions	v/c limit	Service volume (veh/h/lane)	Speed (miles/hr)	Density(veh/mile)
A	Free	0.30	700	60	<12
B	Stable	0.54	1100	57	<20
C	Stable	0.77	1550	54	<30
D	High density	0.93	1850	46	40
E	Near capacity	1.00	2000	30	67
F	**Breakdown**	**>1.0**	**Unstable**	<30	>67

B. PCU Calculation

1) Passenger Car Unit (P.C.U):

Once the numbers of vehicles were calculated under each category, we calculated the PCU by multiplying the number of vehicles in each category with the corresponding factor as given in table3 and table 4.

Table 3 Number of vehicles

Vehicles type	Number of Vehicles
Cars	6900
Cycle	272
Motorcycle	628
Rickshaw	733
Cart	14
Buses/Trucks	545

Table 4 Passenger car unit for different vehicles

	P.C.U
Car	1
Cycle/ Motorcycle	0.5
Rickshaw	1
Cart	4
Truck/bus	3

Multiplying each type of vehicle with its corresponding factor, the PCU at the peak hours was calculated as shown below:

$$P.C.U_{(Peak\ hour)} = (6900*1) + (272*0.5) + (628*0.5) + (733*1) + (14*4) + (545*3)$$

$$= 9{,}774$$

2) Acceptable limits:

According to Highway capacity manual (HCM 1985) maximum P.C.U allowable for Multilane highways is 2,000pcphpl. (pcphpl = passenger cars per hour per lane.) [5]. As the numbers of lanes on Warsak road are four (04), Total allowable P.C.U allowable should be 8,000. In our calculationsit came out to be 9,774. This value clearly suggests that Warsak road has crossed its maximum allowable P.C.Ulimits.

V. RECOMMENDATIONS

To improve the traffic flow on the warsak road, following recommendations were made

1. According to the design, Warsak road is four lane divided highway. But at some places it is restricted to two lanes only. Reasons for restrictions

include encroachments and surface brake-down of the road. The road should be brought back to its actual condition by removing encroachments and repairing the surface of road.

2. There are too many educational institutes on Warsak road. Efforts should be made to shift some of them to any other area of the city.
3. An alternative route should be provided to divert some traffic.
4. Traffic control devices should be installed on priority basis.
5. For the long term results, people should be educated about traffic rules and regulations.
6. Traffic rules should be strictly imposed.

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