Seasonal Variations in Cataract Surgery Numbers in Mid Western and Far Western Terrain Belts of Nepal

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ABSTRACT

Introduction: In western regions of Nepal many more cataract operations are performed during the winter season than the summer season. This causes problems with resource allocation. The aim of this study was to assess the magnitude of seasonal variation in cataract surgery, explore the causes, and make recommendations to optimize resource utilization. **Methods:** Hospital data of the number of patients undergoing cataract surgery in the years 2011, 2012 and 2013 in 3 hospitals was analyzed by month of surgery. 100 consecutive patients having cataract surgery in the winter season and 100 in the summer season were compared for differences and questioned as to the reasons for choosing cataract surgery at that time. **Results:** Of the 127,718 cataract operations performed over 3 years in the 3 hospitals, 45% were performed in the 3 months February-April and 9% in the 3 months June-August. The mean number performed in March (highest volume month) was more than 7 times higher than that performed in July (lowest month) – 8016 versus 1041 per month. At univariate level nationality, marital status, socioeconomic status, cost per surgery, occupation, age and ethnicity were associated with seasonal variations. Multivariate logistic regression analysis of seasonal uptake showed Nationality/Ethnicity, Socioeconomic status and cost per surgery statistically significant in predicting attendance in high season. **Conclusions:** There is a large seasonal variation in cataract surgery numbers in West Nepal. Factors including patients' nationality cost of surgery and cultural beliefs contribute to the seasonal variation. If these can be addressed then resource allocation and utilization can be improved.

Key words: *Cataract, Nepal, resource utilization, seasonal variation*

INTRODUCTION

The total population of Mid and Far Western Regions (MWR + FWR) of Nepal is approximately 6.5 million people. The prevalence of blindness (Corrected visual acuity in the better eye less than 3/60 or visual fields less than 10 degrees is defined as blindness in Nepal and is a World Health Organization definition as well) in MWR/FWR is 0.23% and 0.41% respectively (Mean 0.32%) giving an estimated 20,000 blind people of which 67% is due to cataract[1].

Eye health care in MWR/FWR is primarily provided by the National Non Governmental Organization (NGO) Nepal Netra Jyoti Sangh (NNJS) with support from International Non Governmental Organizations (INGOs). Many patients from northern India come to Nepal for eye care services[2,3].

Recent data from NNJS indicate that people from India contribute more than 55% of total number of cataract surgeries done in Nepal[4]. The observation that more than half of the annual cataract operations are operated in a four month winter / high season caussing difficulties with planning the allocation of resources, particularly cataract surgical teams[4]. If the demand for cataract surgery could be more equally distributed this could improve the efficiency and possibly the quality of cataract service delivery and better resource utilization in the hospital.

The factors associated with seasonal variation in Nepal have not been studied scientifically. The study thus primarily focused in finding out the magnitude of seasonal variation in cataract surgeries, explore the causes and make recommendations to combat the problem

MATERIALS AND METHODS

Records from three hospitals (Nepalgunj, Fateh Bal and Geta Eye Hospitals), for the years 2011, 2012 and 2013 were analyzed to document the number of cataract operations performed each month.These all study hospitals offer similar prices for the cataract surgery. The base eye hospital (Geta Eye Hospital) and Fateh Bal Eye Hospital are under the roof of NNJS, while Nepalgunj Eye Hospital is a private eye hospital with tertiary level services in Mid Western plain belt. Ethical

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approval for the study was obtained from London School of Hygiene and Tropical Medicine (LSHTM), London, and the Institutional Review Board (IRB) of Nepal Netra Jyoti Sangh, Nepal. All the participants were given written and verbal information about the study, and informed consent was obtained from the participants.

Hundred consecutive patients undergoing surgery for age-related cataract in the high volume winter season and 100 patients in the low / summer season were identified and a standard questionnaire was completed to document various demographic and socio-economic factors. The two groups of patients were also questioned as to the reason for attending in high / winter or low / summer season. Hindus were also kept in ethnic groups with a common agreement that, religiously also they are Hindus. Data was collected, entered in Microsoft excel, and analyzed using Stata version 13. A statistician was consulted when necessary.

RESULTS

A total of 127,718 cataract operations were performed in the 3 hospitals over the period 2011- 2013. The magnitude of seasonal variation was similar in all 3 study hospitals Figure 1). Comparison of the socio-demographic variables in 100 patients questioned in the high/winter season and 100 in the low/summer season is summarized in Tables I and II.

In the high season 92% of patients were from India compared with 69% in the low season; and 79% were from middle to high socio-economic strata compared with 36% in summer. Patients in winter were more likely to be married, male gender and older than those coming in summer. Housewives 16% preferred the winter season where as self employed patients 12 % preferred the summer season occupation wise. Despite being from higher socio-economic strata people attending in the high winter season paid less for cataract surgery than those in low summer season – 99% of patients paid <1500 Nepali Rupees (NRs) in the high season compared with 80% of patients paying 2000NRs or more in the low season.

At univariate level nationality, ethnicity, occupation, cost per surgery, socioeconomic status, marital status, age were associated with seasonal variations (Table I, II).

When Multvariable logistic regression analysis of seasonal uptake was undertaken using the dependent binary variable High Season Attendee and the independent predictor variables significant at the univariate level – Age, Nationality, Ethnicity, Marital Status, Occupation, Socioeconomic Status and Cost of Surgery. Nationality and Ethnicity were combined into one variable due to their interactive properties.

Holding all other factors constant, only Nationality/ethnicity, Socio-Economic Status and Cost of Surgery were statistically significant factors in predicting attendance in high season (Table III). When questioned as to why patients came in the high or low season, 54% of patients attending in the high/winter season said that it was because surgery was safer in winter; while those attending in the low/summer season, 51% said it was because of diminished vision Figure 2).

DISCUSSION

Cataracts are the major cause of blindness and visual impairment in developing countries and contribute to more than 90% of the total disability adjusted life years[5]. There have been various studies focussed on the prevalence of cataract and cataract blinds[1], barriers to uptake cataract surgeries[1], the global burden of cataract[5], the modern methods of cataract surgeries including femtosecond laser cataract surgery specially in developed world[6]. However there have not been significant studies about the seasonal variation in cataract surgery till now specially in developing countries where the prevalence of cataract and cataract blinds is very high[1,4]. Seasonal variation in cataract surgery numbers has remained a significant problem in a poor developing nation like Nepal. Where eye health system runs parallel to the general health system[1,4].

The study clearly demonstrates a consistent seasonal variation in cataract surgery numbers over the last 3 years in 3 independent hospitals. The observation that there is a 7 fold variation in monthly numbers between the busiest and least busy months demonstrates the problem of planning resources for good service provision.

The main differences seen in the high/winter season and low/summer season patients was Indian nationality, higher socio-economic strata and need to pay less for surgery in the high/winter season. Patients attending in high season were significantly far less likely to be Nepali (of any ethnic denomination) than Indian Hindu (OR=0.004, 95% CI=0.00-0.9, p=0.00). Patients were also less likely to be Indian Brahmin or Indian Muslim than Indian Hindu, but this was not significant (Table III).

Patients in the high winter season were seven times more likely to be middle or high income than low income (OR=7.3, 95%CI=1.3-41.5, p=0.03). Despite the higher proportion of middle or high income patients in winter, 99% of surgeries in high season were conducted either free or subsidized compared with 20% of those in low season, leading to an extremely low odds ratio of paying in full in high season compared with low season (OR=0.0002, 95%CI=0.0-0.004, p=0.00). The overall model was statistically significant and explained 84% of the variability by season (McFadden's R2=0.84, p=0.00) (Table 3).

The main reason for attendance in the low/summer season was diminished vision (51%); 61% of these patients were from lower socioeconomic strata and 16% of the summer study

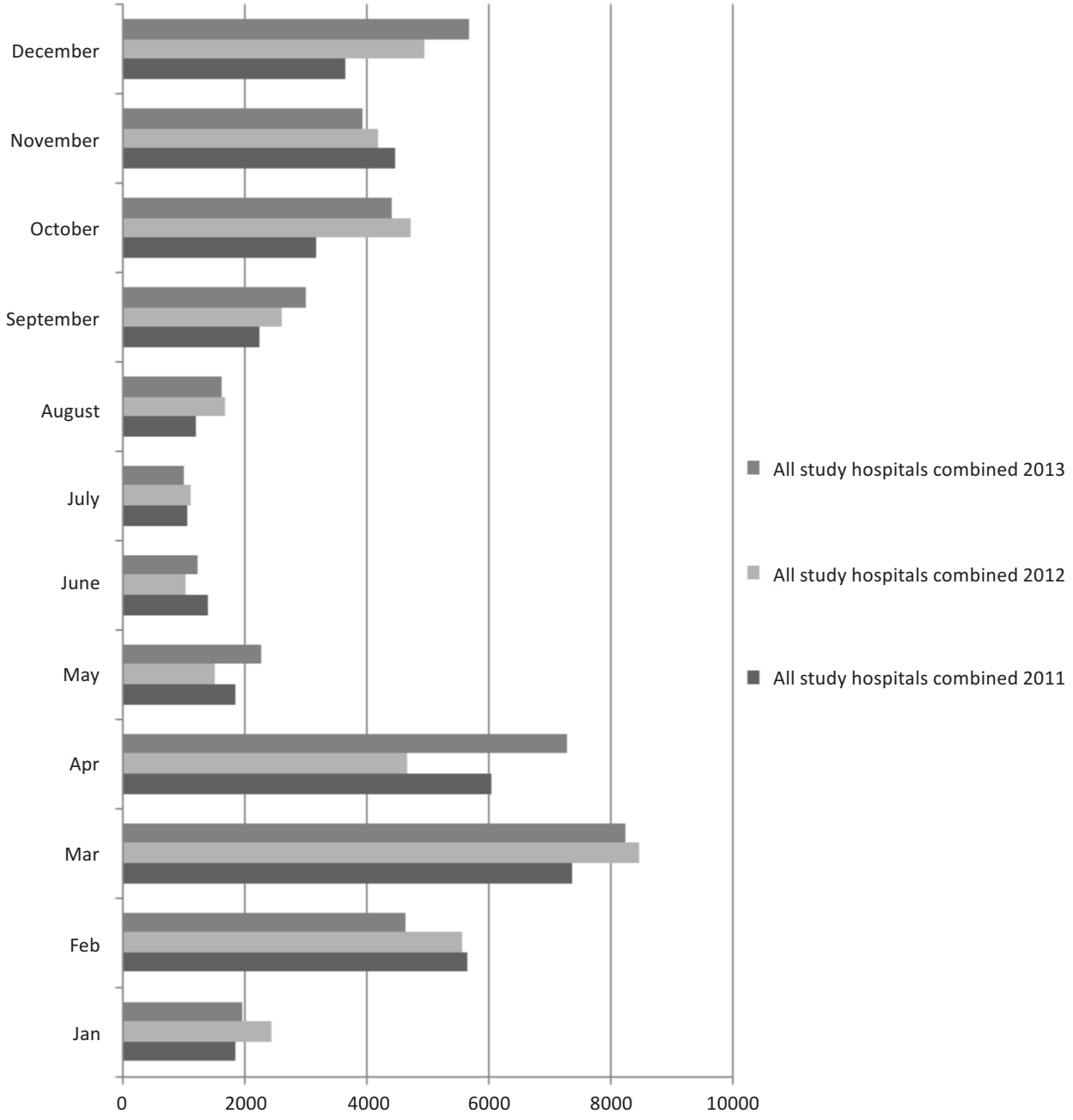


Figure 1: Cataract operations by year and month in 3 Nepali hospitals, 2011-2013.

sample thought the cost per surgery during the summer season is cheaper. However interesting fact which came out from the 200 study subjects of both the seasons was; 99% of the patients in the winter summer season sample were operated in cheaper prices either subsidized or free of cost.

Caution is required in analyzing the data as the 100 patients questioned in summer and winter may not be representative of all patients coming in the high and low seasons, however the study has revealed some interesting information which can be tested to see if people can be persuaded to come in the low / summer season rather that the high / winter season.

Variable	High winter season (100 subjects)	Low summer season (100 subjects)	p value
Gender			
Male	56	43	0.089
Female	44	57	Fisher exact test
Age in years			
Median	60	60	0.0003
Interquartile range	60-65	50-65	Wilcoxon rank-sum
Nationality			
Nepali	8	31	<0.001
Indian	92	69	Fisher exact test
Ethnicity			
Brahmin	9	43	
Tharu	2	19	
Chhetri	17	3	
Magar	0	1	<0.001
Muslim	17	7	Fisher exact test
Vaishya	7	16	
Thakuri	6	1	
Hindu	42	10	
Marital Status			
Married	99	78	<0.001
Widowed	0	21	Fisher exact test
Never married	1	1	
Occupation			
Agriculture	73	74	
Government job	2	4	
Housewife	16	6	0.005
Business	7	3	Fisher exact test
Priest	0	1	
Self employed	2	12	
Socioeconomic status			
Below poverty line	0	20	
Low income	21	41	<0.001
Middle income	77	36	Fisher exact test
High income	2	0	
Education			
No education	78	78	
Primary level	6	8	0.79
Secondary level	9	10	Fisher exact test
College level+	7	4	
Residence			
Remote rural	2	0	
Rural	82	89	0.41
Semi urban	4	3	Fisher exact test
Urban	12	8	

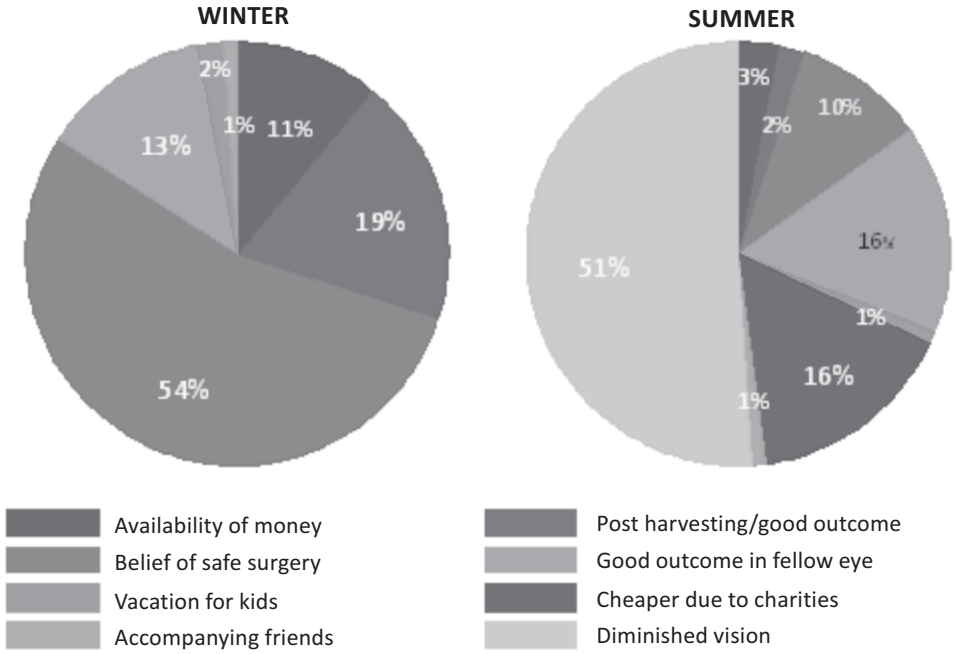
Table I: Comparison of socio-demographic variables in people having cataract surgery in the high/winter and low/summer seasons in 3 Nepali hospitals in 2014

Type of Surgery			
SICS	100	95	
Phacoemulsification	0	4	0.059
Other		1	Fisher exact test
Post operative visual acuity (VA)			
Good	60	65	
Borderline	37	28	0.64
Poor	3	7	Wilcoxon rank-sum
Cost per surgery			
Free of cost	1	20	
<1500 NRS	98	0	
1600 – 2000 NRS	1	0	<0.001
2100 – 3500 NRS	0	75	Wilcoxon rank-sum
5000 – 6500 NRS	0	4	
Other	0	1	
Health Insurance			
Yes	0	1	0.5
No	100	99	Fisher exact test

Table II: Comparison of variables related to the operation of people having cataract surgery in the high / winter and low / summer seasons in 3 Nepali hospitals in 2014

Multivariable Logistic Regression of Predictors of High Season Attendance				
	Low Season Attendees (n=100)	**High Season Attendees (n=100)**	**Odds Ratio (95% CI)**	**p>z**
Age Group				
<65	74%	60%	Baseline	-
>65	26%	40%	1.49 (0.3-8.2)	0.6
Nationality/Ethinicity				
Indian Hindu	9%	37%	Baseline	-
Indian Brahmin	34%	9%	0.26 (0.004-15.4)	0.5
Indian Muslim	7%	17%	0.85 (0.008-88.4)	0.9
Indian Other	19%	29%	0.34 (0.008-14.2)	0.6
Nepalese	31%	8%	0.004 (0.0002-0.1)	0.00
Socioeconomic Status				
Below poverty line or low income	61%	21%	Baseline	-
Middle or High Income	39%	79%	7.3 (0.03-41.5)	0.03
Occupation				
Agriculture	74%	73%	0.2 (0.004-11.4)	0.4
Housewife	6%	16%	Baseline	-
Other	20%	11%	0.2 (0.001-26.0)	0.5
Cost				
Free or Subsidized	20%	99%	Baseline	-
Paid in full	80%	1%	0.0002 (0.0000-0.004)	0.00
Marital Status				
Married	78%	99%	Baseline	-
Never married or widowed	22%	1%	0.2 (0.002-9.7)	0.4

Table III: Multivariable Logistic Regression of Predictors of High Season Attendance



Graphs by season

Figure 2 clearly showing belief for surgery was the main reason for patient attendance during winter, while in summer diminished vision was the main reason for the patient for attending the hospitals.

CONCLUSIONS/RECOMMENDATIONS

It is recommended that the cost of surgery in high/winter be increased or at least equal to the summer cost of the surgery. The free hospital based camps or subsidized surgeries should be encouraged to be done in the summer season more; as the study sample finding could conclude that; the cost per surgery during the winter season is currently lower than the summer season probably due to more charities and funding coming in the winter season.

Most people coming in the winter season are from middle to high socio-economic strata. An increase in price in the winter season or focusing more on subsidized or free surgery during the summer season should not be a barrier to access for cataract surgery but should encourage patients in some shift in choice of seasons. Also consideration should be given to only operating on first eyes in the high/winter season and asking people who want operation on their second eye to come in summer.

As with any policy and behavior change it will be important to inform both providers and patients of why current policy and practice is being changed.

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