Original Article

Multinomial Logistic Regression Model for Predicting Effectiveness of Contraceptive.

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ABSTRACT

Background: Practice of contraceptives effectively by the couples is a challenging task as the present figure of the country is legging behinds the targeted one. It is attributed with several predictors that need to be documented. Objective: The aim of the present study is to predict some of the important socio-demographic predictors and initiates to gauge the magnitude of their causal effects on the effectiveness of contraceptive practice among the eligible couples of Manipur. **Methods:** The present study is based on a primary data of 820 eligible couples and the effectiveness of contraceptive practice ascribed by some of the important predictors and their magnitude of their causal effects is illustrated through the Multinomial Logistic Regression Model. **Results:** The six predictors, considered, can explain 9.4% of the total variation of effective contraceptive practice [R2 (Nagelkerke) = 0.094] and the fitted model fits data well (P<0.001). Out of them, type of family, no. of children, knowledge of contraceptive and attitude of contraceptive of women are found significant impact on the effectiveness of contraceptive practice in Manipur. Though the remaining predictors viz., place of residence, and education of women have still some remarkable causal effects but have less contribution than that of the erstwhile four predictors. **Conclusion:** Out of the six predictors, considered, four are identified as the invaluable ones and that have a significant positive impact on the effectiveness of contraceptive practice. They are type of family, no. of children, knowledge and attitude of women towards contraceptive.

Keywords: Multinomial Logistic Regression Model; Effective contraceptive practice; Type of family, No. of children, Knowledge and Attitude of women.

INTRODUCTION

India is still the second most populous country next to China in the world with nearly a fifth of the world's population.[1,2] The rapid growth of population projects India to be the most populous country with 1.69 billion in 2050.[1] On seeing the impending problems in socio-economic developments due to over populous, India adopted National Family Planning Programme in 1951.[3] The government has been indulging the eligible couples to use various contraceptive devices other than permanent to control unintended pregnancy. In spite of different efforts of the government the result is still unsatisfactory.[4,5] This is perhaps due to the fact that effective use of contraceptives is not yet practiced by majority of the eligible couples. Eventually, the practice of contraceptive devices differ at the individual, family

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and community levels with their roots in the socio-economic, religious and cultural milieu of the society. Thus the diverse manifestations of contraceptive practices provide a very interesting demographic study from the standpoints of peoples' belief, perception and attitude along with their social and cultural milieus towards the regulation of health and population dynamics.

The situation is not exception in Manipur rather complex as it has pluralistic society of multi religious, cultural and ethnicity with diverse attitudes and outlooks. Thus the state has beheld demographic imbalance amongst the diverse communities as being their contrast fertility pattern. Sooner or later, it is triggered mainly through diversified contraceptive practices amongst them self.[4,5] It therefore necessitates to assertion the impact of their social category, knowledge and attitude on the practice of contraceptive devices. Nonetheless there is a lack of proper scientific study on this very innovative human behavioral condition in this tiny part of the country and henceforth the present study is initiated to predict of some the important socio-demographic predictors and initiates to gauge the magnitude of their causal effects on the effectiveness of contraceptive practice

among the eligible couples of Manipur through Multinomial Logistic Regression Model.

MATERIALS AND METHODS

A cross sectional community based study under the titled of "Demographic assessment of contraceptive impact on population dynamics in Manipur" was conducted in Manipur state, India during January 2016 to July 2016. It consists of a primary sample of 820 eligible couples who representing the entire Manipur state and the information were elicited through a pre-tested semi-structural interview schedule. The estimated sample size was based on the prior information i.e., percentage of effectively practice of contraceptive (63.76%) with an allowable error of 3.5 at 95% degree of precision and an attrition rate of 8.5%.

The present study is based only on a piece of information collected i.e., effectiveness of contraceptive practices ascribed by some of the important predictors through Multinomial Logistic Regression Model. The six predictors, considered are the place of residence, type of family, education of women, no. of children, knowledge and attitude of women towards contraceptive whilst contraceptive practice as response variable.

Variable specification:

a) Response variable: CP (Contraceptive Practice; 1 if occasional use, 2 if effectively use, 3 if never use).

b) Predictor variables (X_i): PR (place of residence; 1 if urban, 0 otherwise); TF (type of family; 1 if nuclear, 0 otherwise); EDW (education of women; 1 if literate, 0 otherwise); CHLD (no. of children); KCP (knowledge of contraceptive practice; 1 if sound knowledge, 0 otherwise); and ATCP (attitude towards contraceptive; 1 if positive attitude, 0 otherwise).

RESULTS

In order to analyze Multinomial Logistic Regression Model, the response variable i.e., Contraceptive practice is categorized into three – occasional use, effectively use, and never use. Here, never use is taken as the reference category.

Table 1: Case Processing Summary

		No. of cases	Percentage
Contraceptive practice	Occasional use (1)	466	56.8%
	Effectively use (2)	321	39.1%
	Never use (3)	33	4.0%
Total		820	100.0%

Occasional use (56.8%) is the most common practice of contraceptive in the present sample which is followed by effectively use (39.1%) and the least pertains to never use (4.0%).

Table 2: Pseudo R-Square

Cox and Snell	.076
Nagelkerke	.094
McFadden	.048

Table 3: Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept only	440.715			
final	375.956	64.759	12	<0.001

The six predictors – place of residence, type of family, education of women, no. of children, knowledge of contraceptive practice, and attitude towards contraceptive – can explain 9.4% of the total variation of effective contraceptive practice as evident by R2 (Nagelkerke) = 0.094. Again, the fitted Multinomial Logistic Regression Model fits the present data well (P<0.001).

Table 4: Parameter Estimates

Practice of contraceptive		B	Std. Error	Wald	df	Sig.	Exp(B)/ OR	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Occasional use	Intercept	-.367	.869	.178	1	.673			
	PR	.320	.386	.689	1	.406	1.377	.647	2.932
	TF	.787	.395	3.969	1	.046	2.197	1.013	4.764
	EDW	.325	.690	.223	1	.637	1.385	.358	5.350
	CHLD	.301	.147	4.179	1	.041	1.351	1.012	1.803
	KCP	.231	.490	.222	1	.637	1.260	.482	3.289
	ACP	2.145	.403	28.314	1	<.001	8.545	3.877	18.832
Effectively use	Intercept	-2.047	.924	4.906	1	.027			
	PR	.343	.393	.764	1	.382	1.410	.653	3.046
	TF	.817	.403	4.116	1	.042	2.263	1.028	4.982
	EDW	.617	.714	.748	1	.387	1.854	.458	7.510
	CHLD	.331	.150	4.896	1	.027	1.392	1.039	1.866
	KCP	1.170	.530	4.866	1	.027	3.223	1.139	9.115
	ACP	2.234	.415	29.004	1	<.001	9.336	4.141	21.049

*The reference category is taken as never use.

In the present analysis of parameter estimates through the Multiple Logistic Regression Model, the category never use of contraceptive practice is taken as a reference category. Here the Exp(B)/ odds ratio (OR) corresponding of a predictor indicates how much causal effect is generated on the response variable (CP) when one unit increase in the predictor while the other remaining predictors are taken into constant. If OR > 1 indicates that the risk of the outcome falling in the comparison group relative to the risk of the outcome falling in the reference group increases as the variable increases. While an OR < 1 indicates that the risk of the outcome falling in the comparison group relative to the risk of the outcome falling in the referent group decreases as the variable increases. Thus while interpreting causal effect of one predictor on the response variable, hereafter, unless and otherwise stated, specifies the other remaining predictors are kept constant.

I. Never use relative to occasional use:

Odds ratio (OR) for PR (1.377) indicates that a subject is to increase her PR by one unit, the relative risk for preferring never use to occasional use would be expected to increase by 37.7% given the other variables in the model are held constant. More generally, we can say that if a subject changes their residence from rural to urban, we would expect them to be more likely to prefer occasional use over never use. Again, OR=2.197for TF demonstrates that when the couple of nuclear family has 2.197 times more likely to prefer occasional use over never use which is significant at 5% probability level (P=.046), keeping the other variables in the model are held constant.

When the education of women enhance from illiterate to literate, keeping other variables constant, there is a more likely to prefer occasional use over never use by 38.5% as evident by OR =1.385. Once enhancing one child the couple has significantly prefer to adopt occasional use over never use by 35.1% [OR =1.351]. If the couple has good knowledge of contraceptive practice has 26.0% more likely to prefer occasional use over never use than that of those couple who has poor knowledge on contraceptive practice. Attitude towards the contraceptive practice has a very highly significant role (P<0.001) as those couple has positive attitude has 8.545 times more likely to prefer occasional use over never use than that of those couple who has negative attitude on contraceptive practice [OR =8.545].

II. Never used relative to effectively use:

Whilst we compared never use to effectively use of contraceptive practice through the Multinomial logistic regression model, the following findings are coming up. There is 41.0% more chance of using contraceptive effectively over the never use for urban dweller couples than that of their rural counterparts. This statement is supported by

OR=1.410. Again a significant OR=2.263 further signifies that when the couple of nuclear family has 2.263 times more likely to prefer effectively use over never use than that of joint family couple. Educated or literate women have 1.854 more times likely to adopt effectively use over never use of contraceptive than that of illiterate women (Exp(B) =1.854). When enhancing one child more the couple has again significantly prefer to adopt effectively use over never use by 39.2% [OR =1.392]. If the couple has good knowledge of contraceptive practice has significantly 3.223 times more likely to prefer effectively use over never use than that of those couple who has poor knowledge on contraceptive practice. Attitude towards the contraceptive practice has a very highly significant role (P<0.001) as those couple has positive attitude has 9.336 times more chance to prefer effectively use over never use than that of those couple who has negative attitude on contraceptive practice.

DISCUSSION

The present response variable (contraceptive practice) consists of three categories that are not ordinal (they have no natural ordering), the ordinary least square estimator can't be used and instead, a maximum likelihood estimator like multinomial logit or probit should be used.[6-8] Thus the proposed model i.e., Multinomial Logistic Regression Model is quite suitable one. This is in agreement with the outcomes of the present study that the fitted Multinomial Logistic Regression Model fits the present data well as well as 9.4% of the total variation of contraceptive practice can be explained by the six predictors considered.

The three predictors – TF, CHLD and ACP – out of six predictors considered are found significant impact on contraceptive practice while analysis is made occasional use with never use as reference category while the four predictors namely TF, CHLD, KCP, and ACP witness a very significant bearing towards the regulation of contraceptive practice whilst considering effectively use over never use as reference category.

The women of nuclear family have adopted the contraceptive practice significantly than the women of joint family which was witnessed by many scholars.[9-11] This is true in both the cases – from never use to occasional use, and from never use to effectively use. As in joint family women have fewer problems, due to the support of family members, for bearing and rearing of their children in comparison with the women in nuclear family. And therefore women of nuclear family are compelled to adopt contraceptive practice to restrict the number of children while less compulsion is upon women of joint family. It is quite natural that the couple has less desire to have more children when they achieved their desire number. This

concept is reflected in the present finding that when enhancing one child from the previous number of children they have the couple has significantly prefer to adopt occasional used as well as effectively use over never use as they have less desirous of further child more.

Further in both the cases, ACP has a greater role to adopt effective contraceptive practice as more the positive attitude towards contraceptive practice, higher the adoption rate.[3,8-14] More furtherance, the attitude of a person especially womenfolk on the such flimsy practice becomes the prime heighten effect. Knowledge of contraceptive has also significant impact on contraceptive practice when analysis is made of effectively use with never use as reference category while insignificant impact is noticed to consider occasional use with never use as reference category. Perhaps it might be due to the fact that even a woman who has a proper knowledge on the matter is not necessary to adopt contraceptive practice if she has negative attitude on the contraceptive practice. Henceforth, with a good knowledge as well as a good attitude on the contraceptive practice, one may implement the procedure successfully.[9,12-15]

CONCLUSION

In the present sample, occasional use is the most common practice of contraceptive (more than half of the couples) which is followed by effectively use (around 40%) and the least (below 5%) pertains to never use. The six predictors are considered in the present study and out of them only four are identified as the invaluable ones and that have a significant positive impact on the effectiveness of contraceptive practice. They are type of family, no. of children, knowledge and attitude of women towards contraceptive. The remaining two predictors i.e., place of residence, and education of women have still some remarkable causal effects but have less magnitude of contribution than that of the erstwhile four predictors. Besides, 9.4% of the total variation of effective contraceptive practice can be explained by the six predictors considered in the model. And finally the fitted Multinomial Logistic Regression Model fits data well and it indicates that the model is quite suitable to predict the effectiveness of contraceptive practices, especially having more than two categories with some of the important predictors. Further it is quite suggestible that the authority should make people especially womenfolk to be aware of and inculcate them to create a good attitude towards the Reproductive and Child Health (RCH) Programme in order to ensure effective contraceptive practice so as to achieve Sustainable Development Goals (SDGs) especially goal No. 3 that is Good Health and Well-being.

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