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Awareness of periconceptional folic acid supplementation among Nepalese women of childbearing age: a cross-sectional study

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ABSTRACT

Objective: Maternal folate deficiency is associated with Neural Tube Defects (NTDs), the most common congenital birth defect at Maternity Hospital, Kathmandu, Nepal. NTDs can be prevented with periconceptional folic acid supplementation (FAS). This study was performed to assess the awareness of FAS among women of reproductive age in Kathmandu.

Methods: A semi-structured questionnaire was administered to 400 randomly selected patients aged 15 to 45 years visiting Kathmandu Model Hospital from May to July 2011, seeking any awareness of FAS, knowledge of its impact on fetal development and knowledge of the appropriate time of supplementation.

Results: Forty percent (95% CI 35.1 - 45.0) of women had heard about FAS, 16.3% (95% CI 12.8 - 20.2) knew that folate affects fetal health and 5.0% (95% CI 3.1 - 7.6) knew that it should be taken pre-pregnancy. Level of education was strongly associated with awareness (multivariate Odds Ratio for lowest vs. highest level of education: 0.29, 95% CI 0.15 – 0.56).

Conclusions: Knowledge of FAS is very low among women of childbearing age in Kathmandu. Inclusion of FAS information in health awareness programs is recommended.

Key words: Awareness, Folic acid, Nepal, Neural Tube Defects, Pregnancy

INTRODUCTION

Folic acid deficiency at the time of conception is associated with neural tube defects (NTDs), which include structural anomalies such as spina bifida, encephalocoele and anencephaly. Anencephaly is incompatible with life; with treatment, 80–90% of infants with spina bifida survive with varying degrees of disability. Worldwide NTD incidence is likely to be in the range of 1.4 - 2 per 1000 births, but this figure may be up to four-fold higher in low-income settings (Cherian et al., 2005; Gupta, 2000; Nawapun and Phupong, 2007; Ren et al., 2006).

Folic acid supplementation from one month prior to pregnancy until 12 weeks after becoming pregnant has been shown to decrease both the occurrence and recurrence of NTDs (Blencowe et al., 2010; Czeizel, 1993; Czeizel and Dudás, 1992; De-Regil LM, 2010). Women usually become aware of their pregnancy three weeks after becoming pregnant, at which time supplementing with folic acid may be too late to prevent NTDs (Sadler, 1998). Having a planned pregnancy and awareness of the mother may, therefore, be major factors in preventing NTDs by folic acid supplementation. This study aims to measure the level of knowledge of periconceptional folic acid supplementation among women attending a maternity clinic in Kathmandu, Nepal.

METHODS

A cross-sectional study was designed and conducted at Kathmandu Model Hospital, Kathmandu, Nepal, between May 1 and July 31, 2011. A semi-structured questionnaire was developed and participants randomly selected from women aged 15 - 45 years visiting the Gynecology and Obstetrics outpatient department.

The three outcomes assessed were (1) awareness, defined as having heard or read about folic acid supplementation (yes/no answer) (2) knowing that folic acid protects the fetus (choosing from three possible options) and (3) knowing that folic acid should be taken prior to pregnancy (choosing from four possible options). Information regarding age, education, profession, marital status and pregnancy status was recorded in order to allow for an analysis of the predictors for awareness to be performed.

Sample size was determined assuming 50% prevalence of awareness, giving a minimum required sample size of 384 in order to measure this prevalence with 5% precision. Our sample size was 400. Ethical approval was obtained from the Institutional Review Committee of the Hospital. The questionnaire was administered by interview, with verbal consent obtained from the participants prior to interview. All interviews were conducted by the same member of the study team (PP).

Statistical analyses

All statistical analyses were performed using STATA 12 software. The percentages of women answering questions correctly were calculated and 95% confidence intervals derived using the binomial distribution. Responses were cross-tabulated against demographic information and univariate and multivariate logistic regression applied in order to assess predictors of awareness.

RESULTS

None of the women who were asked to participate in the study declined to respond. Table 1 contains descriptive information of the 400 participants, the percentage of positive responses and the results of univariate and multivariate analyses.

The proportion of women who had heard of folic acid supplementation was 40.0% (95% confidence interval (CI) 35.1% - 45.0%), while 16.3% (95% CI, 12.8% - 20.2%) knew that folic acid affects fetal health and just 5.0% (95% CI 3.1% - 7.6%) knew that it should be taken prior to pregnancy.

In multivariate analysis, women under the age of 25 demonstrated lower awareness and had less knowledge of appropriate timing of supplementation than women aged 25-35 years. There was strong evidence for a decreasing trend in awareness with decreasing level of education, strong evidence that those without a university education were less aware of the effect on the fetus than those who had been to university and weak evidence of a decreasing trend in knowledge of appropriate timing of supplementation with decreasing education level. The majority (68.1%) of women who were aware identified health institutions and health workers as their source of information (data not shown).

Table 1: Descriptive, univariate and multivariate analysis of folic acid supplementation awareness among attendees at Kathmandu department of Gynecology and Obstetrics, Kathmandu Model Hospital, 2011

		Total women n (%)	Have heard of folic acid supplementation			Know that folic acid affects fetal health			Know folic acid should be taken before pregnancy		
			n (%)	Crude OR[a] (95% CI[b])	Adjusted[c] OR (95% CI)	n (%)	Crude OR (95% CI)	Adjusted OR (95% CI)	n (%)	Crude OR (95% CI)	Adjusted OR (95% CI)
All women		400 (100.0)	160 (40.0)	-	-	65 (16.3)	-	-	20 (5.0)	-	-
By age (years)	<25	156 (39.0)	55 (35.3)	0.60 (0.39 – 0.94)	0.61 (0.38 – 0.99)	24 (15.4)	0.84 (0.47 – 1.49)	0.84 (0.45 – 1.56)	3 (1.9)	0.21 (0.06 – 0.76)	0.19 (0.05 – 0.69)
	25-35	179 (44.8)	85 (47.5)	1	1[d1]	32 (17.9)	1	1	15 (8.4)	1	1[d2]
	36-45	65 (16.3)	20 (30.8)	0.49 (0.27 – 0.90)	0.74 (0.38 – 1.46)	9 (13.9)	0.74 (0.33 – 1.64)	1.14 (0.47 – 2.79)	2 (3.1)	0.35 (0.08 – 1.56)	0.93 (0.18 – 4.78)
By level of education	Up to 2°	106 (26.6)	29 (27.4)	0.27 (0.16 – 0.47)	0.29 (0.15 – 0.56)	12 (11.3)	0.36 (0.18 – 0.74)	0.41 (0.18 – 0.97)	1 (0.9)	0.10 (0.01 – 0.76)	0.15 (0.02 – 1.39)
	2° and higher 2°	147 (36.7)	46 (31.3)	0.33 (0.21 – 0.54)	0.34 (0.20 – 0.57)	15 (10.2)	0.34 (0.17 – 0.62)	0.35 (0.17 – 0.71)	6 (4.1)	0.44 (0.16 – 1.19)	0.59 (0.20 – 1.80)
	University-level	147 (36.7)	85 (57.8)	1	1[d3]	38 (25.9)	1	1[d4]	13 (8.8)	1	1[d5]
By profession	Employed	207 (51.8)	95 (45.9)	1	1	41 (19.8)	1	1	14 (6.8)	1	1
	Housewife	193 (48.2)	65 (33.7)	0.60 (0.40 - 0.90)	0.93 (0.56 – 1.53)	24 (12.4)	0.57 (0.33 – 0.99)	0.84 (0.43 – 1.63)	6 (3.11)	0.44 (0.17 – 1.18)	0.61 (0.20 – 1.90)
By marriage status	Married	375 (93.8)	153 (40.8)	1	1	62 (16.5)	1	1	20 (5.3)	-	-
	Unmarried	25 (6.2)	7 (28.0)	0.56 (0.23 - 1.38)	0.52 (0.19 - 1.43)	3 (12.0)	0.69 (0.20 - 2.37)	0.66 (0.17 - 2.57)	0 (0.0)	-	-
By pregnancy status	Pregnant	200 (50.0)	91 (45.5)	1	1	39 (19.5)	1	1	15 (7.5)	1	1
	Non-pregnant	200 (50.0)	69 (34.5)	0.63 (0.42 - 0.94)	0.76 (0.47 - 1.24)	26 (13.0)	0.62 (0.36 - 1.06)	0.69 (0.36 - 1.30)	5 (2.5)	0.32 (0.11 - 0.89)	0.33 (0.11 - 1.03)

[a]**OR:** Odds Ratio [b]**CI:** Confidence Interval [c]**Adjusted for:** all other variables in the table

[d1-5]**p-values** (result of Likelihood Ratio Test of overall association of covariate with outcome, after adjustments): [d1]**p**=0.118, [d2]**p**=0.015, [d3]**p**(test for trend)<0.001, [d4]**p**=0.008, [d5]**p**(test for trend)=0.061

DISCUSSION

Interpretation

When compared with studies performed in low-income settings, our folic-acid awareness result of 40.0% (95% CI 35.1% - 45.0%) was comparable with results from a study carried out in China's Shanxi province (Ren et al., 2006) (36%) and higher than that of a study from Delhi, India (Gupta, 2000) (20%). Compared to results of studies performed in higher income countries such as Thailand - 76% (Nawapun and Phupong, 2007), Canada - 95% (French et al., 2003) and USA - 78% (Canfield et al., 2006) the level of awareness we observed was low. The very low % of women in our study who knew about fetal effect and appropriate time of supplementation in relation to pregnancy (16.3% and 5.0% respectively) was lower than the Chinese study (30% and 23% (Ren et al., 2006)) but comparable to the study from India (Gupta, 2000), where no women demonstrated knowledge of these facts. Our findings that being under the age of 25 and having less education were associated with lower awareness are consistent with results published in previous studies that included these co-variates (Abdulrazzaq et al., 2003; Alozie Arole et al., 2003; Canfield et al., 2006).

The very low level of awareness of periconceptional folic acid supplementation in our setting could be attributed to a number of factors. Firstly, it could be due to the very low level of education among Nepalese women (UNESCO, 2011). Secondly, it may be that, although most health professionals know about folic acid supplementation, they are not counselling women appropriately (Aggrawal et al., 2010; Gupta, 2000). Thirdly, there is no nationwide health education campaign in Nepal about periconceptional folic acid supplementation, unlike for iodine fortification and iron and calcium supplementation. An underlying issue relating to the second and third of these factors could be the lack of NTD prevalence data for Nepal. Prevalence surveys in India have estimated very high NTD prevalence (Cherian et al., 2005). Without similar surveys for Kathmandu, the perception of a need to raise awareness may be lacking.

Limitations

Our study was underpowered for the univariate and multivariate analysis of risk factors for knowledge of effect on timing. However, the associations observed are consistent with those obtained for the other two questions. In addition, income level was not included as a co-variate although given the setting, we may have been unlikely to have obtained categories. We were not resourced to assess the intra-observer reliability of the questionnaire.

Generalisability

Participants were randomly selected attendees of the Gynecology and Obstetrics department of Kathmandu Model Hospital, so would have been a representative sample of women of childbearing age attending this hospital. As over 80% of the population of Nepal live in rural areas (UN, 2008) and the majority of Nepalese women would not have private hospital access, our results are likely to be an overestimation of the level of awareness across Nepal.

Conclusions and Recommendations

This study has shown a very low level of awareness of periconceptional folic acid supplementation amongst women of child-bearing age in Kathmandu, Nepal. Predictors for lack of awareness were being under the age of 25 and not having had a university education. Very high NTD prevalence has been recorded in comparable low-income settings (Kulkarni et al., 1987; Verma, 1978), and a recent study using records of births from Maternity Hospital, Kathmandu (Malla, 2007) showed that NTDs were the most commonly observed congenital birth defect (37%). Over 60% of NTDs could be prevented with periconceptional folic acid supplementation (Blencowe et al., 2010). In urban areas of Nepal such as Kathmandu, folic acid tablets are readily available and affordable. We would recommend inclusion of periconceptional folic acid supplementation in future health education campaigns within Kathmandu. Inclusion as a part of higher school-level education would ensure women receive the appropriate information early enough for supplementation to occur before pregnancy. Further work is needed to obtain NTD prevalence figures for Kathmandu and elsewhere in Nepal.

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CONFLICTS OF INTEREST

The authors declare there is no conflict of interest

REFERENCES

Abdulrazzaq, Y.M., Al-Gazali, L.I., Bener, A., Hossein, M., Verghese, M., Dawodu, A., Padmanabhan, R., 2003. Folic acid awareness and intake survey in the United Arab Emirates. Reproductive Toxicology 17, 171-176.

Aggrawal, A., Kumhar, G., Harit, D., Faridi, M., 2010. Role of folic acid supplementation in improving NTD: Physicians yet unaware. J. Prev. Med Hyg 15, 131-132.

Alozie Arole, C., Puder, K., Rezna, M., Eby, E., Zhu, B., 2003. Folic acid awareness in Michigan, 1996-1999. Obstet Gynecol. 102, 1046-1050.

Blencowe, H., Cousens, S., Modell, B., Lawn, J., 2010. Folic acid to reduce neonatal mortality from neural tube disorders. International Journal of Epidemiology 39, i110-i121.

Canfield, M.A., Przybyla, S.M., Case, A.P., Ramadhani, T., Suarez, L., Dyer, J., 2006. Folic acid awareness and supplementation among Texas women of childbearing age. Preventive Medicine 43, 27-30.

Cherian, A., Seena, S., Bullock, R.K., Antony, A.C., 2005. Incidence of neural tube defects in the least-developed area of India: a population-based study. The Lancet 366, 930-931.

Czeizel, A., 1993. Prevention of congenital abnormalitites by periconceptional multivitamin supplementation. BMJ 306.

Czeizel, A.E., Dudás, I., 1992. Prevention of the First Occurrence of Neural-Tube Defects by Periconceptional Vitamin Supplementation. New England Journal of Medicine 327, 1832-1835.

De-Regil LM, F.-G.A., Dowswell T, Peña-Rosas JP, 2010. Effects and safety of periconceptional folate supplementation for preventing birth defects. Cochrane Database of Systematic Reviews 10.

French, M.R., Barr, S.I., Levy-Milne, R., 2003. Folate intakes and awareness of folate to prevent neural tube defects: A survey of women living in Vancouver, Canada. Journal of the American Dietetic Association 103, 181-185.

Gupta, P., 2000. Awareness regarding use of folic acid for prevention of congenital neural tube defects. . Natl Med J India. 2000.

Kulkarni, M.L., Mathew, M.A., Ramachandran, B., 1987. HIGH INCIDENCE OF NEURAL-TUBE DEFECTS IN SOUTH INDIA. The Lancet 329, 1260.

Malla, B., 2007. One year review study of congenital anatomical malformation at birth in Maternity Hospital (Prasutigriha), Thapathali, Kathmandu. Kathmandu University Medical Journal 5, 557-560.

Nawapun, K., Phupong, V., 2007. Awareness of the benefits of folic acid and prevalence of the use of folic acid supplements to prevent neural tube defects among Thai women. Archives of Gynecology and Obstetrics 276, 53-57.

Ren, A., Zhang, L., Li, Z., Hao, L., Tian, Y., Li, Z., 2006. Awareness and use of folic acid, and blood folate concentrations among pregnant women in northern China—An area with a high prevalence of neural tube defects. Reproductive Toxicology 22, 431-436.

Sadler, T.W., 1998. Mechanisms of neural tube closure and defects. Mental Retardation and Developmental Disabilities Research Reviews 4, 247-253.

UN, 2008. World Urbanization Prospects: The 2007 Revision Population Database, in: Nations, U. (Ed.).

UNESCO, 2011. Adult Literacy Rate in Nepal. .

Verma, I., 1978. High frequency of neural-tube defects in North India. The Lancet 8069, 879 - 880.