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Original Research Article

Effectiveness of a Nutritional Education Intervention Program for Reducing Anemia in Pregnant Women of Western Nepal: A Hospital-Based Study

Hiroko Sakai[1]; Kumsun Lee[1*]; Yoko Oda Thapa[2]; Rina Kawata[3]; Akiko Iwakuni[1]; Rajesh Adhikari[4]; Tulsi Ram Bhandari[5]

[1] Kansai Medical University, Faculty of Nursing, Graduate School of Nursing, Japan
[2] Action research for community health international, Nepal
[3] Osaka University, Graduate School of Medicine, Division of Health Sciences, Osaka, Japan
[4] Pokhara Academy of Health Sciences, Nepal
[5] School of Health and Allied Sciences, Faculty of Health Science, Pokhara University, Nepal
*Corresponding author
Email: leekum@hirakata.kmu.ac.jp
ORCID: 0000-0003-4699-7718

Abstract

The anemia rate among pregnant Nepalese women remains high and has not significantly declined over the past 20 years. This study aimed to assess the effectiveness of a nutritional intervention program for reducing anemia in pregnant women. We conducted an intervention study among pregnant women visiting Western Regional Hospital in Pokhara, Nepal, from March 2019 to March 2020. We involved 138 participants in this study and divided them into three groups- education, distribution, and control. Hemoglobin levels were evaluated before and after the intervention. This study revealed that the mean hemoglobin values after the intervention were 11.65 ± 0.59 mg/dL in the education group, 11.15 ± 1.08 mg/dL in the distribution group, and 11.14 ± 1.19 mg/dL in the control group. The changes in hemoglobin levels were 1.40 ± 0.84 mg/dL in the education group, 0.96 ± 1.21 mg/dL in the distribution group, and 0.87 ± 1.11 mg/dL in the control group. The difference in the change in hemoglobin levels among the three groups was statistically significant. In conclusion, anemia during pregnancy can be effectively reduced through individual nutritional counseling using visual educational materials. Therefore, there is an urgent need to develop a national standard model of a nutritional education protocol for maternal women combined with training programs for maternal healthcare workers to upgrade their nutrition counseling skills.

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Introduction

In the Federal Democratic Republic of Nepal, substantial progress has been made in healthcare delivery. However, perinatal mortality remains high (Shrestha et al., 2012; Shrestha et al., 2014). The Nepal Demographic and Health Survey 2022 indicated that the prevalence of anemia among women aged 15–49 years in Nepal increased from 36% in 2006 to 41% in 2016 and declined to 34% in 2022. This indicates that the distribution of iron supplements alone does not appear to have an effect (Padmadas et al., 2006). Anemia causes motor and sensory system dysfunction, delays cognitive and physical development, and decreases concentration, activity, and academic performance (Sazawa et al., 2014). Anemia is associated with several perinatal

complications during pregnancy, including increased perinatal and maternal mortality, preterm delivery, and low birth weight (McLean et al., 2009; Levy et al., 2005). Preventing anemia is a critical global concern because it poses a burden on pregnant women and the health of the next generation.

Nutritional counseling is beneficial for addressing and improving anemia (Sunuwar et al., 2019). Although nutritional counseling is included in antenatal care (ANC) services, the percentage of pregnant women receiving this education is significantly low (Merriel et al., 2021). Furthermore, there are few reports on educational interventions and empirical evaluations to improve anemia during pregnancy (Silva Lopes et al., 2021). We must consider the comprehensibility of educational materials when teaching patients with low health literacy, for which we developed pictorial booklets and nomograms. This study aimed to assess the effectiveness of a nutritional intervention program in reducing anemia in pregnant women.

Methods and Materials

Research Design

This study used a quasi-experimental pre–and post-study design.

Intervention Design

One hundred fifty-six pregnant women were randomly divided into three groups (education, distribution, and control), with 52 women in each group.

The education program group received three face-to-face individual nutritional education programs of approximately 10 min each from a trained enumerator using educational materials, including pictures, photographs, and nomograms without text. The distribution group received the same educational materials as the education program group but did not receive an individual nutritional education program. The control group consisted of pregnant women who received only regular antenatal health checkups. They received educational materials after delivery to ensure that they were not disadvantaged.

Health education was conducted through individual interviews with participants to check their understanding and knowledge level on the following topics: medical knowledge of anemia in pregnant women, its impact on mothers and children, Nepalese women's food culture and nutritional bias, foods and cooking methods to prevent and improve anemia, the importance of iron supplementation, adherence to iron tablet intake, and dealing with side effects.

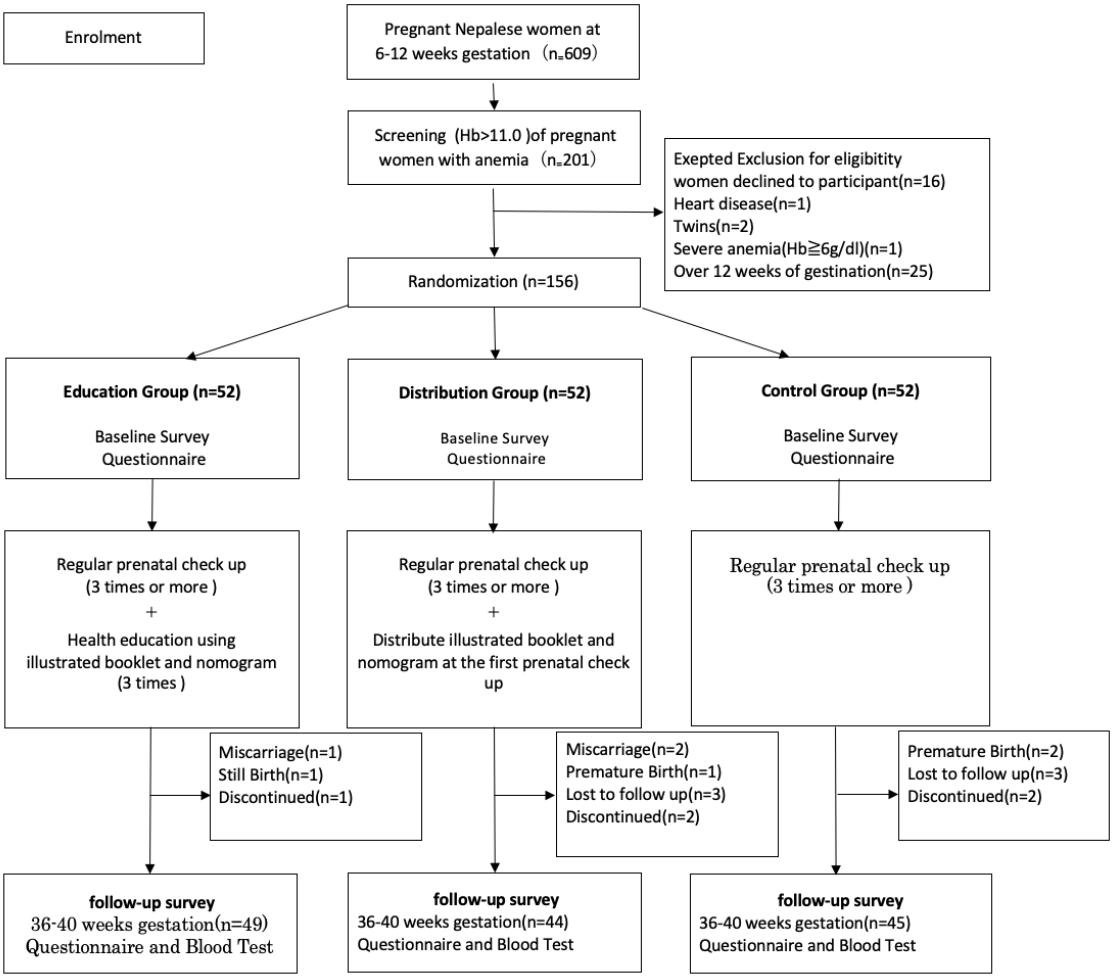
Blood samples were drawn from pregnant women at 8–12 weeks of gestation, and 201 pregnant women with hemoglobin (Hb) levels > 11.0 mg were screened for anemia. Of these, 16 pregnant women who did not consent to participate in this study, one pregnant woman with heart disease, two pregnant women with twin pregnancies, one pregnant woman with severe antenatal anemia, and 25 eligible women with a gestational age > 12 weeks were excluded. A total of 156 pregnant women were allocated to one of the three groups using block randomization. The participants were allocated to an intervention group that received three health education sessions using an illustrated booklet and nomogram, a group that received an illustrated booklet and nomogram, and a target group that received a general prenatal checkup.

One miscarriage, one stillbirth, and one discontinuation were excluded from the intervention group, resulting in a total of 49 participants. One premature birth, three lost to

follow-up, and two discontinued were excluded from the group that received the booklet and nomogram, leaving 44 as the final participants. The target group consisted of 45 participants excluding one premature birth, three lost to follow-up, and two discontinued (Figure 1).

Figure 1

Flowchart of Study Participation and Follow-up (Western Regional Hospital)



Research Period and Site

This study was conducted from March 2019 to March 2020 and included pregnant women visiting the Western Regional Hospital in Pokhara, Nepal, for antenatal checkups. This facility is the only public hospital in Pokhara, approximately 200 km northwest of Kathmandu. Additionally, it has the largest number of institutional deliveries. The pregnant women visiting the facility resided in Kaski District and surrounding mountainous and rural areas adjacent to Pokhara City. The residential community in this area comprises many ethnic groups and individuals from various socioeconomic backgrounds. Thus, this facility was selected as a suitable collaborating facility for this study to examine the risk factors for anemia, including socioeconomic, regional, religious, ethnic, and environmental factors.

Eligibility Criteria for Selection

The eligibility criteria for this study included pregnancy, ≥ 16 years of age married women, willingness to provide consent, anemia with Hb level < 11 g/dL, early pregnancy at 8–13 weeks of gestation, and absence of current medical condition other than anemia requiring treatment. The exclusion criteria included an Hb level > 11 g/dL, refusal to participate in this study, and the presence of a condition other than anemia requiring treatment.

Study Population and Sample Size

The study population included pregnant women who visited the Western Regional Hospital in Pokhara, Nepal, for antenatal checkups. Details of the region in which the hospital is located are mentioned above.

To demonstrate the effect of the nutritional education intervention program using pictures and graphs, we estimated and calculated an effect size of 0.3571 (difference of 5 g/dL Hb/standard deviations [SDs], 14 g/dL Hb, before and after, respectively), an α of 0.05, a power of 0.95, and a dropout rate of 15%, with a sample size of 156 participants (n = 156).

Study Tools

Information on the social background and health status was collected using a questionnaire that included items to be checked during the general maternal health examination. The items in the questionnaire included the following: surname to identify ethnicity and caste; age (date of birth); number of weeks of pregnancy; place of residence; religion; age at marriage; family structure; pregnancy history; number of children; birth interval; employment status of the mother and spouse; occupation of the mother, spouse, and father; annual household income; education of the mother and spouse; literacy of the mother and spouse; workload (work hours and burden); burden (working hours and sense of burden); spouse's interest in and understanding of antenatal checkup; maternal health and nutrition status (regular oral medication, smoking, alcohol consumption, smoking and exposure to secondhand smoke, number of meals, amount of meat, fish, and beans consumed); malaria, parasite, or tuberculosis infection or human immunodeficiency virus and acquired immunodeficiency syndrome in the past six months; and iron tablet intake.

Blood samples were collected to measure Hb levels, and data analysis was performed at the laboratory of the collaborating research facility. The Hb cutoff level (in accordance with the World Health Organization) was defined as < 11.0 g/dL in pregnant women with anemia.

Data Collection Procedures

First, a block randomization method was used. After allocation, information on the participants and their blood samples was collected. Each intervention method was then implemented, and blood samples were collected again. The survey was conducted by Nepali native speaker registered nurses who understood the purpose and content of this study and had received training for this study in advance. First, they explained the questions and response procedure (in Nepali) to the study participants. The enumerators then completed the questionnaire on behalf of the participants. If participants were aged 17–19 years and consent was obtained from both the individual and a partner or guardian aged > 20 years. All the

participants received verbal and written confirmation from the research nurse that their partners' approval had been obtained for participating in this study.

Data Analysis Methods

We calculated frequencies and percentages to describe the characteristics of the study population. Continuous variables were assessed using means and SDs. In addition, Hb levels served as a measure of the educational effects in the three groups before and after the intervention, and analysis of variance tests was performed. The statistical software IBM SPSS Statistics Software (SPSS) 28.0.1 was used for analysis and fixed the significance level at 5% ($P < 0.05$).

Ethical Considerations

After approval from the Institutional Review Committee (IRC) (No. 2018180) of the principal investigator's educational institution, this study was approved by the IRCs of the Nepal Health Research Council (No. 358) and Western Regional Hospital (No. 64). This study was enrolled in the UMIN clinical trial (MIN000049603). The survey was conducted using the Nepali version of the questionnaire, with a unique identification number for pregnant women who provided their consent.

Results

The mean age of the participants was 24.4 (range, 16–38) years. Similarly, the mean age at marriage was 20 ± 3.4 (range, 14–31) years. The mean age of their first childbirth was 21.1 ± 3.2 (15–32) years. More than 80% of the participants lived in urban areas, whereas only 18.8% lived in rural areas. Most women (92%) were Hindus, whereas the rest were Buddhists or followed other religions. Nearly half of the population were Brahmins and Chettris (47%), followed by Janajatis (29%), Dalits (21%), Muslims, Madhesis, and others (2.9%). Approximately 50% of the participants had a history of their first pregnancy, 32.6% had a second pregnancy, and 16.7% had a third or more pregnancy. Furthermore, 77 participants had not experienced childbirth. Only one patient had an age gap of < 1 year from the previous delivery, 25 participants had an age gap of 1–2 years, and approximately 35 participants had an age gap of ≥ 3 years. Most participants took iron tablets during pregnancy (Table 1).

Table 1

Demographic Characteristics of the Participants (n = 138)

	Mean ± SD (Range)
Age (years)	24.4±4.5（16-38）
Age of marriage (years)	20.0±3.4（14-31）
Age of first give birth (years)	21.1±3.2（15-32）
Residence	**n (%)**
Urban	112 (81.2)
Rural	26 (18.8)
Religion	**n (%)**
Hindus	127(92.0)
Buddhist	6(4.3)
Others	5 (3.6)
Ethnic/Caste	**n (%)**
Bramin, Chettri	65 (47.1)

Janajati	40 (29.0)
Dalit	29 (21.0)
Muslim, Madeshi, and Others	4 (2.9)
Number of children	**n (%)**
0 (No children)	77 (55.8)
1	53(38.4)
2	8(5.8)
Duration from last delivery	**n (%)**
<1 year	78(56.5)
1-2 year	25(18.1)
3 year or more	35(25.4)

SD: standard deviations

All the participants were anemic at the beginning of the study (n = 156). During the study trial, three patients had miscarriages, one had stillbirth, three had premature birth, six were lost to follow-up, and five participants of discontinuation were excluded from the data analysis. Thus, we considered 138 participants, which is a valid sample size for this study. The numbers of women in the education, distribution, and control groups were 49, 44, and 45, respectively. After the intervention, there were no participants with severe anemia. Of the 138 patients with anemia, 101 became non-anemic, and only 37 remained anemic.

The mean values of Hb after the intervention were 11.65 ± 0.59 g/dL in the education group, 11.15 ± 1.08 g/dL in the distribution group, and 11.14 ± 1.19 g/dL in the control group. The changes in Hb levels were 1.40 ± 0.84 g/dL in the education group, 0.96 ± 1.21 g/dL in the distribution group, and 0.87 ± 1.11 g/dL in the control group. Improvement in Hb levels was most prominent in the education group, followed by the distribution and control groups. We observed that the difference in the change in Hb levels among the three groups was statistically significant ($P < 0.05$) (Table 2).

Table 2

Comparison of Hemoglobin (Hb) Levels for Base Line and End Line in Three Groups (n=138)

Measurement	Hb level g/dl			
	Education group (n=49)	Distribution group (n=44)	Control group (n=45)	p-value
	Mean±SD	Mean±SD	Mean±SD	
Baseline	10.20±0.62	10.19±0.69	10.27±0.51	0.804
Endline	11.65±0.59	11.15±1.08	11.14±1.19	<0.035*
Change	1.40±0.84	0.96±1.21	0.87±1.11	<0.035*

SD: standard deviations; ANOVA: analysis of variance; * ANOVA significant at p<0.05

Discussion

The results indicated that the education group showed the greatest improvement in Hb levels, suggesting that individual nutrition counseling combined with the distribution of educational material is the most effective method. The distribution group showed greater improvement in Hb levels than the control group but not as significant as the education group. Therefore, individual counseling is important in changing maternal dietary habits to reduce anemia. An analysis of the effects of pictures on health education based on the four aspects of McGuire's information processing theory (attention, information comprehension, message recall, and adherence) revealed that pictures were significantly effective in all aspects (McGuire,

1981). Educational materials were developed based on the results of this study. Our intervention team consisted of one gynecologist, one supervisor nurse, and four staff nurses who received training from the research supervisor before the program, ensuring that inquiries made by clients about dietary habits and nutrition during this study were immediately resolved and fed back to the clients.

A systematic review reported that antenatal micronutrient supplementation and educational interventions successfully improved maternal and neonatal outcomes in Nepal (Toolan et al., 2022). A randomized controlled trial showed that an educational program combined with routine iron supplementation could improve Hb levels and reduce the prevalence of anemia in pregnant women by 59% (Adhikari et al., 2009), similar to our findings. A quasi-experimental study conducted at the Tribhuvan University Teaching Hospital in Kathmandu (Sunuwar et al., 2019) supported our results that providing nutritional education and an iron-rich diet plan was significantly associated with improved Hb levels. The change in Hb level was significantly greater in the intervention group than in the control group (0.56 ± 0.40 gm/dL vs. 0.16 ± 0.82 gm/dL). The consumption of iron-rich foods was significantly higher in the intervention group than in the control group ($P < 0.05$). Moreover, a hospital-based cross-sectional study reported that women who did not consume iron-rich food during pregnancy were three times more likely to develop anemia than their counterparts (Yadav et al., 2019). Their study showed that approximately 80% of women could not identify at least one iron-rich food source, indicating that accurate knowledge of iron-rich foods is lacking among Nepalese women.

These findings indicate that nutritional education effectively prevents anemia during pregnancy. However, despite this, the reality of ANC services in Nepal is unfavorable. A qualitative study on perceptions of the quality of healthcare services reported that participants mentioned that besides providing free folic acid tablets and physical checkups, the ANC service had nothing more to offer (Rajbanshi et al., 2021). One study demonstrated that only 21% of Nepalese women received good-quality ANC, whereas another revealed that only 56% were satisfied with their ANC (Merriel et al., 2021; Adhikari et al., 2020).

ANC service components include danger signs, nutrition counseling, sexually transmitted infection counseling, birth preparedness, contraceptives, breastfeeding, nausea and vomiting, constipation, back and pelvic pain, heartburn, edema, varicose veins, and smoking. Among these components, the proportion of pregnant women who received nutritional counseling at the health facility is significantly lower (9%) than that of other components, such as advice on danger signs (55%), or advice on edema and varicose veins (61%). Although nutritional counseling is predominantly provided in private hospitals (61%), it is not usually provided in government hospitals (1%) (both referral and secondary hospitals), showing a large gap between hospital categories. Nutritional education is essential because it is closely associated with anemia, which may lead to serious complications and the risk of maternal death. However, according to the aforementioned studies, nutritional topics have not been discussed significantly during the limited checkup time per patient.

Nutritional care during pregnancy does not mean merely providing free iron/folic acid tablets; however, most pregnant women do not receive nutritional care through educational materials from health facilities, which may play an important role. Therefore, the government should realize that merely distributing iron tablets without an educational program for pregnant mothers cannot resolve the issue of anemia during pregnancy, which has persisted for over 20 years.

Our findings suggest that the proper use of educational materials that meet clients' literacy levels will lead to behavioral changes that improve anemia. A national standard model of a nutrition education protocol for pregnant women combined with an on-site training program for ANC clinic staff is required to eliminate disparities between health facilities.

Our study demonstrates that nutritional counseling is expected to improve dietary habits and compliance with iron medication for the primary prevention of anemia. However, further studies are required to verify whether nutritional education can prevent perinatal complications and the recurrence of postpartum anemia as a tertiary prevention effect in pregnant women with anemia.

Moreover, health education, as a component contributing to health promotion, promotes voluntary behavioral changes by influencing awareness, knowledge, skills, beliefs, attitudes, and values (Teijlingen et al., 2021). The intervention group exposed to nutrition education has transformed knowledge, skills, awareness, beliefs, attitudes, and values through the literacy-tailored program, resulting in voluntary behavior modification. Improving health literacy is important for changing the awareness, beliefs, attitudes, and values of pregnant women in Nepal and promoting voluntary behavioral change (Sakai et al., 2024). A detailed investigation of the cognitive changes observed in the intervention group in the future may reveal the factors that contribute to enhanced behaviors related to anemia and effective interventions.

Limitations

This study has several limitations. Our study site was a referral-level public hospital in Pokhara; therefore, the results cannot be widely generalized, especially regarding peripheral facilities, such as health posts. Further studies are required to understand the situation in the rural areas of Nepal. In addition, we did not use biomarkers related to iron deficiency anemia, such as mean corpuscular volume, ferritin, or total iron-binding capacity, which can provide more information on iron metabolism.

Conclusion

Anemia during pregnancy can be effectively reduced through individual nutrition counseling using visual education materials designed especially for clients with low health literacy backgrounds. Furthermore, the government should realize that merely distributing iron tablets without an educational program for pregnant mothers cannot solve the issue of anemia during pregnancy, which has remained at a consistently high incidence in Nepal for over two decades. An urgent need exists for a national standard model of a nutritional education protocol for maternal women combined with a training program for maternal healthcare workers to upgrade their nutrition counseling skills.

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Conflict of Interest

All the authors declared no conflicts of interest in publishing this paper.

Authors' Contribution

All the authors contributed to the conception and design of this study. Sakai managed the field research, conducted the statistical analyses, and prepared the manuscript. Lee and Iwakuni contributed to the discussion of the results and revision of the article after peer review. Oda was responsible for the field research and manuscript writing. Kawata contributed to the statistical analyses and discussion of the results. Iwakuni and Tulsi Ram Bhandari critically reviewed and edited the manuscript. Rajesh Adhikari supervised the field coordination and research nurses. All authors read and agreed to publish this paper in this journal.

References

Adhikari, K., Liabsuetrakul, T., & Pradhan, N. (2009). Effect of education and pill count on hemoglobin status during prenatal care in Nepalese women: A randomized controlled trial. *Journal of Obstetrics and Gynaecology Research*, *35*(3), 459–466. https://doi.org/10.1111/j.1447-0756.2008.00970.x

Adhikari, M., Chalise, B., Bista, B., Pandey, A. R., & Upadhyaya, D. P. (2020). Sociodemographic correlates of antenatal care visits in Nepal: Results from Nepal Demographic and Health Survey 2016. *BMC Pregnancy and Childbirth*, *20*(1), 513. https://doi.org/10.1186/s12884-020-03218-x

Levy, A., Fraser, D., Katz, M., Mazor, M. & Sheiner, E. (2005). Maternal anemia during pregnancy is an independent risk factor for low birthweight and preterm delivery. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, *122*(2), 182–186. https://doi.org/10.1016/j.ejogrb.2005.02.015

McGuire, W. J. (1981). Behavioral medicine, public health and communication theories. *Health Education*, *12*(3), 8–13. https://doi.org/10.1080/00970050.1981.10618148

McLean, E., Cogswell, M., Egli, I., Wojdyla, D., & Benois, B. (2009). Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993-2005. *Public Health Nutrition*, *12*(4), 444–454. https://doi.org/10.1017/S1368980008002401

Merriel, A., Maharjan, N., Clayton, G., Toolan, M., Lynch, M., Barnard, K., Lavender, T., Larkin, M., Rai, N., Thapa, M., Caldwell, D. M., Burden, C., Manandhar, D. S., & Fraser, A. (2021). A cross-sectional study to evaluate antenatal care service provision in 3 hospitals in Nepal. *AJOG Global Reports*, *1*(3), 100015. https://doi.org/10.1016/j.xagr.2021.100015

Ministry of Health and Population of Nepal. (2022). Nepal Demographic and Health Survey 2022; Key Indicators Report. https://dhsprogram.com/pubs/pdf/PR142/PR142.pdf

Padmadas, S. S., Dias, J. G., & Willekens, F. J. (2006). Disentangling women's responses on complex dietary intake patterns from an Indian cross-sectional survey: A latent class analysis. *Public Health Nutrition*, *9*(2), 204–211. https://doi.org/10.1079/PHN2005842

Rajbanshi, S., Norhayati, M. N., & Nik Hazlina, N. H. (2021). Perceptions of good-quality antenatal care and birthing services among postpartum women in Nepal. *International Journal of Environmental Research and Public Health*, *18*(13), 6876. https://doi.org/10.3390/ijerph18136876

Sakai, H., Kawata, R., Adhikari, R., Thapa, Y. O., & Bhandari, T. R. (2024). Effectiveness of art-based health education on anemia and health literacy among pregnant women in Western Nepal: A randomized controlled trial. *PLOS ONE*, *19*(9), e0281789. https://doi.org/10.1371/journal.pone.0281789

Sazawal, S., Dhingra, U., Dhingra, P., Dutta, A., Shabir, H., Menon, V. P., & Black, R. E. (2014). Efficiency of red cell distribution width in identification of children aged 1-3 years with iron deficiency anemia against traditional hematological markers. *BMC Pediatrics*, *14*, 8. https://doi.org/10.1186/1471-2431-14-8.

Shrestha, M. K., Guo, C. W., Maharjan, N., Gurung, R., & Ruit, S. (2014). Health literacy of common ocular diseases in Nepal. *BMC Ophthalmology*, *14*, 2. https://doi.org/10.1186/1471-2415-14-2

Shrestha, M., Shrestha, L., Basnet, S., & Shrestha, P. S. (2012). Trends in perinatal mortality in Tribhuvan University Teaching Hospital: 13 years review. *Journal of Nepal Paediatric Society*, *32*(2). https://doi.org/10.3126/jnps.v32i2.6898

Silva Lopes, K., Yamaji, N., Rahman, M. O., Suto, M., Takemoto, Y., Garcia-Casal, M. N., & Ota, E. (2021). Nutrition-specific interventions for preventing and controlling anaemia throughout the life cycle: an overview of systematic reviews. *Cochrane Database of Systematic Reviews*, *9*(9), CD013092. https://doi.org/10.1002/14651858.CD013092.pub2

Sunuwar, D. R., Sangroula, R. K., Shakya, N. S., Yadav, R., Chaudhary, N. K., & Pradhan, P. M. S. (2019). Effect of nutrition education on hemoglobin level in pregnant women: A quasi-experimental study. *PLoS One*, *14*(3), e0213982. https://doi.org/10.1371/journal.pone.0213982

Teijlingen, K. R., Devkota, B., Douglas, F, Simkhada, P., & Teijlingen, E. R. (2021). Understanding health education, health promotion and public health. *Journal of Health Promotion*, *9*(01), 1–7. https://doi.org/10.3126/jhp.v9i01.40957

Toolan, M., Barnard, K., Lynch, M., Maharjan, N., Thapa, M., Rai, N., Lavender, T., Larkin, M., Caldwell, D. M., Burden, C., Manandhar, D. S., & Merriel, A. (2022). A systematic review and narrative synthesis of antenatal interventions to improve maternal and neonatal health in Nepal. *AJOG Global Reports*, *2*(1), 100019. https://doi.org/10.1016/j.xagr.2021.100019

Yadav, K. D., Yadav, U. N., Wagle, R. R., Thakur, D. N., & Dhakal, S. (2019). Compliance of iron and folic acid supplementation and status of anaemia during pregnancy in the Eastern terai of Nepal: Findings from hospital-based cross-sectional study. *BMC Research Notes*, *12*(1), 127. https://doi.org/10.1186/s13104-019-4167-6