

# Preconception Health Behaviors and Associated Factors of Bhutanese Pregnant Women Attending Antenatal Care Clinic of National Referral Hospital

นิพนธ์ต้นฉบับ

Original Article

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## บทคัดย่อ

**วัตถุประสงค์:** เพื่อตรวจสอบพฤติกรรมเตรียมความพร้อมก่อนตั้งครรภ์ (เช่น การกินอาหารที่มีประโยชน์ การกินกรดโฟลิก หลีกเลี่ยงแอลกอฮอล์และการไม่กินหมาก) และปัจจัยที่เกี่ยวข้องในสตรีชาวภูฏานที่มาฝากครรภ์ **วิธีการศึกษา:** กลุ่มตัวอย่างเป็นสตรีที่มาฝากครรภ์ครั้งแรกที่โรงพยาบาลศูนย์แห่งชาติจิกมี วังชุก ประเทศภูฏาน จำนวน 90 คน โดยเลือกกลุ่มตัวอย่างแบบสะดวก การเก็บรวบรวมข้อมูลใช้การสัมภาษณ์ด้วยแบบสอบถามแบบมีโครงสร้างซึ่งประกอบด้วยแบบสอบถามข้อมูลส่วนบุคคลและข้อมูลทางการแพทย์ แบบวัดการวางแผนการตั้งครรภ์ของลอนดอน แบบสอบถามความรู้เกี่ยวกับการเตรียมความพร้อมก่อนตั้งครรภ์และแบบสอบถามพฤติกรรมเตรียมความพร้อมก่อนตั้งครรภ์ วิเคราะห์ข้อมูลโดยใช้สถิติพรรณนา สัมประสิทธิ์สหสัมพันธ์แบบเพียร์สัน สัมประสิทธิ์สหสัมพันธ์พอยซ์ไบซีเรียลโคสแควร์ และการทดสอบของฟิชเชอร์ **ผลการศึกษา:** พบว่าร้อยละ 82.2 ของสตรีกลุ่มตัวอย่างมีพฤติกรรมเตรียมความพร้อมก่อนตั้งครรภ์อย่างน้อยหนึ่งพฤติกรรม แต่เมื่อวิเคราะห์รายพฤติกรรมพบว่ามีการปฏิบัติกันน้อยและหลากหลาย โดยการกินกรดโฟลิกก่อนที่จะตั้งครรภ์เพียงร้อยละ 4.4 ( $n = 4$ ) กินอาหารที่มีประโยชน์ร้อยละ 23.3 ( $n = 21$ ) และกินหมาก (ร้อยละ 68.1,  $n = 32$ ) พฤติกรรมเตรียมความพร้อมก่อนตั้งครรภ์โดยรวมสัมพันธ์กับความรู้อย่างมีความรู้เกี่ยวกับการเตรียมความพร้อมก่อนตั้งครรภ์ ( $r = 0.22, P = 0.04$ ) และความตั้งใจในการตั้งครรภ์ ( $r = 0.46, P < 0.001$ ) อย่างมีนัยสำคัญทางสถิติ เมื่อวิเคราะห์แต่ละพฤติกรรมพบว่าความตั้งใจในการตั้งครรภ์เป็นปัจจัยที่สัมพันธ์กับพฤติกรรมเตรียมความพร้อมก่อนตั้งครรภ์หลายพฤติกรรม **สรุป:** ผลการศึกษาเสนอแนะว่าควรมีการจัดกิจกรรมการพยาบาลเพื่อส่งเสริมให้สตรีมีพฤติกรรมเตรียมความพร้อมก่อนที่จะตั้งครรภ์ในทุกด้าน โดยเน้นให้สตรีมีความรู้เกี่ยวกับการเตรียมความพร้อมก่อนตั้งครรภ์และมีการวางแผนการตั้งครรภ์เป็นอย่างดี

**คำสำคัญ:** พฤติกรรมเตรียมความพร้อมก่อนตั้งครรภ์, กรดโฟลิก, สตรีตั้งครรภ์, ความรู้, การกินอาหารที่มีประโยชน์, แอลกอฮอล์

## Abstract

**Objective:** To examine the preconception health behaviors (e.g. healthy eating, folic acid consumption, alcohol avoidance and no chewing of betel nut) and associated factors among Bhutanese pregnant women. **Methods:** A convenience sample of 90 pregnant women visiting the antenatal care clinic for the first booking visit at Jigme Dorji Wangchuk National Referral Hospital in Bhutan participated in this study. Data were collected through a face-to-face interview using the structured questionnaires that consisted of Personal and Medical Information Questionnaire, London Measure of Unplanned Pregnancy, Preconception Care Knowledge Questionnaire, and Preconception Health Behavior Questionnaire. Descriptive statistics, Pearson's product moment correlation, Point Biserial correlation, Pearson's Chi-square and Fisher's exact test were used to describe the demographic data and examine the relationships. **Results:** 82.2% of the women adopted at least one of the preconception health behaviors, but few with varied findings were reported for each behavior examined. Preconceived folic acid consumption was the least behavior adopted (4.4%,  $n = 4$ ) followed by changing to healthy diet (23.3%,  $n = 6$ ) and chewing of betel nut (68.1%,  $n = 32$ ) even after pregnancy. Overall preconception health behaviors showed a significantly positive correlation with the preconception care knowledge ( $r = 0.22, P = 0.04$ ) and pregnancy intention ( $r = 0.46, P < 0.001$ ). When each behavior was examined for the four factors, pregnancy intention was the only factor associated with most of the behaviors. **Conclusion:** Findings suggest that nursing interventions should aim at encouraging women to adopt all aspects of preconception health behaviors. Emphasis should be put on improving their knowledge about the behaviors and planning for the effective pregnancy.

**Keywords:** Preconception health behaviors, folic acid, pregnant women, knowledge, healthy diet, alcohol

## Introduction

The concept of active preparation for pregnancy prior to conception continues to be a challenge for women all over the world. Despite various benefits associated with improving women's health before pregnancy in optimizing pregnancy outcomes, many women were found to enter pregnancy in less than optimal health and exposed to many health risk

behaviors, which increases the risk of adverse pregnancy outcomes. Additionally, even where strong public health programs across the life-courses are in place, they do not guarantee that women enter pregnancy in good health.<sup>1</sup> Providing interventions before pregnancy to detect, treat, and help women modify behaviors, health conditions, and risk

factors that contribute to adverse maternal and infant health outcomes can improve pregnancy outcomes for women and infants.<sup>2</sup> Moreover, successive evidences from various studies indicate that lack of preconception care as a contributory factor in maternal and neonatal mortality and morbidity.

Preconception care (PCC) is defined as the provision of bio-medical, behavioral and social health interventions to women and couples before conception occurs.<sup>1</sup> It is aimed to improve their health status by modifying behaviors and environmental factors that contribute to poor maternal and child health outcomes providing interventions which may not be available or which maybe too late once pregnancy is confirmed. The core components of PCC as categorized by the Centre for Disease Control and Prevention<sup>2</sup> are assessment, health promotion and interventions. Assessment involves screening and identifying women, family, or couple with any conditions either medical or behavioral, which can affect pregnancy and its outcome. Health promotion consists of counseling on healthy behaviors before and during pregnancy. Finally, the last component intervention includes an education about nutritional supplements, risk of unhealthy behaviors, family planning methods and many others. Basically, the main goal of PCC is to provide health promotion, screening and interventions to reduce the risk factors that might affect future pregnancy.

Accordingly preconception health behaviors (PCHB) are defined as any health behaviors practiced by women in child bearing age before conception to optimize overall physical and mental health status and therefore pregnancy outcomes<sup>3</sup>, which can be summed up as the practice of PCC or availability of any services of PCC. Women of child bearing age either pregnant or not can have conditions, be exposed to substances, or be engaged in high health risk behaviors like smoking, drinking alcohol, chewing betel nut which leads to adverse pregnancy outcomes. And even behavioral risk has been identified as a serious threat to mother and infant health by various studies.<sup>3</sup> Hence, practice of PCHB which includes avoiding health risk behaviors, initiating and maintaining interventions which include folic acid use, healthy diet consumption, and vaccination leads to healthy pregnancy and its outcome in terms of weeks of gestation, and prevention of birth defects and low birth weight.

From the various health behaviors identified, this study aimed to focus only on behaviors which were found important for assessment among Bhutanese women. These behaviors included folic acid consumption, healthy eating, avoiding or cessation of alcohol and betel nut (areca nut) consumption. This was due to the prevalence of high rates of birth defects (136 cases) according to 2015 report of birth defect surveillance of three referral hospitals in Bhutan, with the highest rate of 96 cases being reported from the Jigme Dorji Wangchuk National Referral Hospital [JDWNRH], Thimphu.<sup>4</sup> Cases with the highest rate were fetal alcohol spectrum disorder (FASD, 8.4/1000 live births), congenital heart defect (CHD, 1.47/1000 live births) and orofacial clefts (2.57/1000 live births) which were much higher than the global prevalence rate. Similarly, in another study, CHD was reported among 34 babies out of a total of 495 births in the year 2010 at a referral hospital in Bhutan.<sup>5</sup> These incidences of birth defect could have been prevented by improving the health behavior of a woman and folic acid supplementation before pregnancy as previous studies showed relationship between a lack of essential vitamins and practice of health risk behaviors before and during pregnancy with various birth defects.

Based on current best available evidence, women of child bearing age planning a pregnancy consuming 0.4 mg folic acid daily have been found to prevent and reduce incidences of neural tube defects by 80% of orofacial clefts, preeclampsia and megaloblastic anemia combined.<sup>6-10</sup> However, in Bhutan, preconception use of folic acid is not a common practice. Women start taking folic acid only after they are prescribed once they visit the hospital after getting pregnant. The combination of iron-folic acid is prescribed for women when they come to antenatal clinic which is usually during the fourth month of their pregnancy.<sup>11</sup> It is prescribed to prevent anemia during pregnancy and not for prevention of neural tube defects.

Prevalence of anemia among pregnant women in Bhutan has been consistently high and is reported among 46.10% of pregnant women as of 2011.<sup>12</sup> Anemia is caused by a lack of mineral iron in the body or lack of other vital vitamins which is basically due to poor dietary habits. Good nutrition is important prior to conception and during the first 12 weeks of pregnancy as woman's nutritional status during pregnancy depends on the availability of nutritional reserves of particular micronutrients such as calcium and iron. Studies

showed that maternal anemia during pregnancy is associated with preterm birth and low birth weight<sup>13,14</sup> and even maternal under-nutrition and iron deficiency have accounted for at least 20% of maternal mortality worldwide in 2010.<sup>1</sup> Improved maternal nutrition before pregnancy was found to increase fetal growth and reduce adverse birth outcomes.<sup>15</sup>

Moreover, alcohol consumption is a common practice among women in Bhutan as it is not stigmatized in Bhutanese society. National health survey report of 2012<sup>16</sup> showed that 28.1% of Bhutanese population aged between 15 and 75 years were alcohol drinkers and 24% drank on a daily basis. 18% of females were found to be current drinkers. Even in two other studies, 52.9%<sup>17</sup> and 70.9%<sup>18</sup> of women were found consuming alcohol prior to pregnancy and many still consumed even during pregnancy (48% and 38.9% respectively). Hence, if this habit of drinking alcohol is continued even during pregnancy, it can lead to adverse pregnancy outcomes, since alcohol consumption during pregnancy has been found to be associated with FASD, higher risk of still birth and preterm birth, and increased spontaneous abortion as evidenced by many studies.<sup>8,19-22</sup> Furthermore, betel (areca) nut consumption is also a common practice among Bhutanese population and on average, Bhutanese women chewed betel nut 6.3 times daily.<sup>16</sup> Chewing betel nut during pregnancy have been found to be associated with development of anemia at delivery, folate deficiency, neonatal withdrawal syndrome and low birth weight babies.<sup>23-26</sup>

However, various factors have been found to have impact on the practice of PCHB. But the authors' most notable findings were the positive correlations between the practice of PCHB of these women and various factors including their educational level, presence or absence of a health risk (chronic disease conditions, and bad obstetric history), pregnancy planning and PCC knowledge. Previous studies found that level of education of women plays an important role in modifying health risk behaviors before and during pregnancy. Women with higher educational level were found more involved in preconception folic acid intake<sup>27-30</sup>, and in reduction or cessation of alcohol intake and reporting changing to a healthier diet before they became pregnant.<sup>31</sup> Women with lower education were found significantly associated with betel nut consumption during pregnancy.<sup>24</sup>

But however, some studies found no relationship between the women's educational level and the practice of PCHB.<sup>32-34</sup>

Existing and/or previous medical conditions among these women were found to be associated with initiating preconception folic acid consumption and also with reducing or stopping alcohol intake before conception.<sup>29,31,35</sup> These conditions included diabetes, hypertension, cardiac diseases, previous stillbirth, birth of a baby with birth defects, preterm births, low birth weights, previous miscarriages, complicated pregnancy and pregnancy loss. A change to a healthier diet was also found significant among women with health risk.<sup>31</sup> However, some other studies found no relationship among health risk and practice of any of the PCHB.<sup>34,36,37</sup>

Additionally, planned pregnancy was associated with an increase in preconception folic acid intake and reduction in alcohol consumption, and a change to healthier diet before pregnancy.<sup>3,29,31,38</sup> However, in one study, there was no association found between pregnancy intention and no heavy alcohol use.<sup>36</sup>

Finally having good knowledge regarding PCC and its benefits is also associated with a receipt of PCC service and practice such as a start of folic acid intake four weeks before pregnancy.<sup>28</sup> With a low level of PCC knowledge, the practice of preconception care has been found low.<sup>39,40</sup> A lack of knowledge regarding effect of betel nut on pregnancy and fetus and potential consequences of alcohol and betel nut exposure prior to pregnancy was considered a significant factor for women to continue such consumption even during pregnancy.<sup>25,26,41</sup> However, according to a systematic review of factors in preconception health behavior research<sup>3</sup>, it showed that despite greater knowledge and awareness of PCC, there was association between the awareness and practice of PCC.

As the health of a women before pregnancy is important in order to have a healthy and uncomplicated pregnancy and to give birth to a healthy baby, it is vital to assess women's behavior prior to pregnancy and any change of the behavior while planning for pregnancy. Although there have been several studies assessing the behavior of women during pregnancy, particularly alcohol consumption, there has been no study examining PCHB and the factors associated with it among women in Bhutan. Therefore, the aim of this study was to assess the PCHB among pregnant women attending the antenatal care clinic (ANC) at Jigme Dorji Wangchuk National Referral Hospital, Thimphu and the factors

associated with it. Generating research evidence in this area will not only create awareness regarding the significance of PCHB and its associated factors but also help develop a preconception health policy and guideline with a variety of support packages that address the needs of women before pregnancy and thereby improving maternal and child health. Creating awareness regarding PCHB will also help reducing the burden of care resulting from having unhealthy babies with congenital abnormalities and other associated problems.

## Methods

This descriptive correlational study was conducted at Jigme Dorji Wangchuk National Referral Hospital (JWDNRH), Thimphu, the capital city of Bhutan. JWDNRH is the highest level referral center in the country.

### Population and sample

The target population of the study was the pregnant women within an age range of 18 - 45 years old residing in Thimphu who visited the antenatal care clinic for the first booking visit. This was to identify women exposed to health risk behaviors at the earliest stage and to improve their behavior during pregnancy. The other reason for choosing women coming for the first booking visit was to minimize recall bias on the behaviors before conception.

The study sample consisted of 90 pregnant women. The inclusion criteria for the participants were 1) age of 18 years or older, 2) coming for the first booking visit, 3) both singleton and multiple pregnancies, and 4) Bhutanese nationality. They also had to be able to communicate in Bhutanese.

The sample size (N) for this study was calculated using Thorndike's formula<sup>42</sup> of  $N \geq 10(k) + 50$  where k was the number of independent variables. Since the study had 4 independent variables, a sample size of 90 participants was needed. Purposive sampling method was used to recruit the participants.

### Research instruments

Data were collected using 4 questionnaires.

### Personal and medical information

This questionnaire was developed by the researcher and had 9 items which included demographic characteristics

(age, marital status, education, occupation, gravida, and parity) and medical information such as presence of any medical conditions, previous obstetric history, and previous birth history.

### London Measure of Unplanned Pregnancy (LMUP)

This is a six-item questionnaire developed by Barrett colleagues.<sup>43</sup> It is a self-reported measure that retrospectively evaluates the extent to which a woman's pregnancy was planned or intended that scores pregnancy planning intention. Since each question carries a score of 2 points making a total score of 12 points. Scores of 0 to 9 are categorized as "unplanned," and 10 or greater "planned." In our study, LMUP yielded an acceptable internal consistency reliability with a Cronbach's alpha of 0.85.

### Preconception Care Knowledge Questionnaire (PCKQ)

This questionnaire was developed by the researcher based on literature review. It consisted of 12 questions with "yes/no" response. With a score of 1 point for "yes" answer and 0 point for "no" answer, the total score ranged from 0 to 12. A total score of 6 or higher was interpreted as having a high knowledge level while those lower than 6 points as a low knowledge level. It yielded a content validity index for scales (S-CVI) of 0.83 and internal consistency reliability of 0.70 by KR-20 which were both acceptable for newly developed questionnaires.

### Preconception Health Behavior Questionnaire (PHBQ)

This questionnaire was developed by the researcher based on literature review. It consisted of 10 questions regarding practice of PCHB, such as, healthy eating, folic acid consumption, avoiding or cessation of alcohol and betel nut use. From the 10 questions, 7 were formatted as yes/no format. Of these seven items, 4 were categorized as positive behaviors of PCHB, while the rest 3 as negative ones. The other 3 questions provided further support to interpret and describe each behavior. Practice of each positive behavior was given a score of 1 which makes a total score of 4 points where higher score indicated higher level of involvement in PCHB. This PHBQ yielded a content validity index for scales (S-CVI) of 0.80 which was acceptable for a newly developed questionnaire.

### Data collection procedure

The research was approved by the Institutional Review Board (IRB) for Graduates Studies, Faculty of Nursing, Burapha University, Thailand (approval no. 01-02-2560). Further, it was reviewed and approved by the Research Ethics Board of Health (REBH), Ministry of Health of Bhutan. Permission for data collection from the concerned authorities at the setting was obtained.

The participants were recruited solely on a voluntary basis on those willing to participate, and those who had met the sample inclusion criteria. Participant information sheet was provided and consent was obtained before data collection. Data were collected by face-to-face interview in a quiet, private, comfortable room after they were done with booking registration and check-up. It took around 10 - 15 minutes to complete the questionnaires.

### Data analysis

Data were coded and entered into a statistical software program for analysis. A statistical significance with an alpha level of 0.05 was set. Data were tested for normality and assumptions applicable for Pearson's product moment correlation analysis. Descriptive statistics were used to describe the demographic information data where mean with standard deviation and frequency with percentage were used for continuous and categorical data, respectively. Pearson's product moment correlation coefficient was used to determine the association between overall PCHB with education level, pregnancy intention, and PCC knowledge. Since health risk was taken as a dichotomous variable, i.e., presence or absence of a health risk, point-biserial correlation was used to determine the association between overall PCHB with the health risk. Pearson's chi-square test or Fisher's exact test, when appropriate, was used to determine the association between each of the behavior (healthy diet, folic acid consumption, avoiding/cessation of alcohol and betel nut use) with education level, health risk, pregnancy intention, and specific behavior knowledge.

## Results

### Demographic characteristics of the participants

Of the 90 pregnant women attending the ANC for the first booking visit and who met the inclusion criteria, their demographic characteristics are presented in Table 1. Their

age ranged from 18 to 39 years old with a mean of 27.11 years. The most found educational level was middle secondary (30.00%) while those with Bachelor's degree or higher was 25.60%. In addition, 7.8% of the participants never had any formal education. The most dominant occupation of the participants was housewife (43.30%), followed by private sector employees (22.20%), government employee (16.70%) and business owner (14.40%). Majority of the participants had their first (52.20%) followed by second (25.60%) and third (15.60%) pregnancy. As a result, the majority had no birth (54.40%).

**Table 1** Demographic characteristics of the study participants (N = 90).

Variable	N	%
<b>Age (yrs), range: 18 – 39, mean ± SD: 27.11 ± 4.63</b>		
18 – 25	34	37.80
26 – 34	51	56.70
≥ 35	5	5.60
<b>Education level (Yrs), range: 0 – 18, mean ± SD: 10.49 ± 4.88</b>		
No formal education	7	7.80
Primary (6 yrs)	12	13.30
Middle secondary (10 yrs)	27	30.00
Higher secondary (12 yrs)	21	23.30
Bachelor's or higher	23	25.60
<b>Occupation</b>		
Housewife	39	43.30
Government employee	15	16.70
Private sector employee	20	22.20
Business owner	13	14.40
Others	3	3.30
<b>No. of pregnancy, range: 1 – 5, mean ± SD: 1.78 ± 0.98</b>		
1	47	52.20
2	23	25.60
3	14	15.60
4	5	5.60
5	1	1.120
<b>No. of births, range: 0 – 3, mean ± SD: 0.69 ± 0.88</b>		
0	49	54.40
1	24	26.70
2	13	14.40
3	4	4.40

### The preconception health behaviors

When overall PCHB was considered, 82.20% reported at least one PCHB with a mean of 1.42 ( $\pm 0.98$ ) (Table 2). However, when each individual behavior was examined, results were different. Preconception folic acid consumption was the lowest PCHB adopted (4.4%) followed by changing to a healthy diet before pregnancy (23.30%). Preconception folic acid consumption was reported only among 4.4% of the participants where they initiated 4 weeks, 8 weeks and 12 weeks before conception and all consumed on a daily basis.

In terms of alcohol consumption, 60 participants (or 66.67%) reported that they avoided or stopped consuming alcohol. Of these 60 participants, 57 had never taken any alcohol and 3 stopped when planning to get pregnant. Alcohol consumption was seen in 30 participants (33.33%). Of these 30 participants, 24 stopped when pregnant (80.0%) while the rest 6 participants (20.0%) continued drinking during pregnancy although on an occasional basis.

Avoidance or cessation of betel nut consumption was reported by 43 participants (47.80%); while 47 (52.20%) did not make such effort. Of these 47 participants, 15 of them (31.90%) stopped when they were pregnant while 32 (68.10%) continued the consumption during pregnancy. Of these 32 participants, 5 of them (15.60%) reported consuming on a daily basis; while 13 (40.60%) and 14 (43.80%) participants consumed on most days and on occasional basis, respectively.

**Table 2** Preconception health behaviors (PCHB) (*N* = 90).

Preconception health behaviors	N	%
<b>Overall PCHB, range: 0 – 4, mean <math>\pm</math> SD: 1.42 <math>\pm</math> 0.98</b>		
At least 1 or more PCHB	74	82.20
No PCHB	16	17.80
<b>Specific PCHB</b>		
<b>Change to a healthy diet</b>		
Yes	21	23.30
No	69	76.70
<b>Folic acid consumption</b>		
No	86	95.60
Yes	4	4.40
Time of initiation (weeks before pregnancy)		
4 week	2	50.00
8 week	1	25.00
12 week	1	25.00
<b>Avoid/cessation of alcohol consumption</b>		
Yes	60	66.67
Never drunk	57	95.00
Stopped when planning to get pregnant	3	5.00
No	30	33.33
Currently drinking	6	20.00
Stopped when pregnant	24	80.00
<b>Avoidance/cessation of betel nut consumption</b>		
Yes	43	47.80
No	47	52.20
Currently consuming	32	68.10
Stopped when pregnant	15	31.90

### Description of the associated factors

Years of education of the participants ranged from 0 to 18 years (Table 3). Once categorized into 2 groups, 46 of 90 participants (51.51%) had 10 years of education of less while the rest 48.90% had more than 10 years which included those with Bachelor's and Master's degree.

In terms of health risk, it was reported in 19 of participants (21.10%). These risks included chronic diseases or any medical conditions, and obstetric problems such as previous adverse pregnancy and outcomes, which could affect pregnancy and its outcomes. Of these 19 participants with the risks, 8 of them (8.9%) were diagnosed with hypertension, heart disease, anemia, and hepatitis B; while the other 8 (8.9%) had a history of miscarriage. Preterm child, child with low birth weight, and child with other conditions/abnormalities were found in 2, 1 and 2 participants, respectively.

In terms of pregnancy intention, 47 of 90 participants reported their pregnancy was unplanned (52.20%) while the rest 43 participants reported otherwise (47.80%). The mean score of this intention was 7.44 ( $\pm$ 3.70). With a possible total score of 12, the participant's acquired scores ranging from the lowest of 1 to the highest of 12 with a mean score of 8.36 ( $\pm$ 2.33).

**Table 3** Description of associated factors (*N* = 90).

Associated factors	N	%
<b>Education (yrs), range: 0 – 18, mean <math>\pm</math> SD: 10.49 <math>\pm</math> 4.88</b>		
$\leq$ 10yrs	46	51.10
> 10yrs	44	48.90
<b>Health risk</b>		
No	71	78.90
Yes*	19	21.10
Relevant medical conditions	8	8.90
Previous miscarriage	8	8.90
Preterm child	2	2.20
Child born with low birth weight	1	1.10
Child with other conditions/abnormalities	2	2.20
<b>Pregnancy intention, range: 1 – 12, mean <math>\pm</math> SD: 7.44 <math>\pm</math> 3.70</b>		
Unplanned	47	52.20
Planned	43	47.80
<b>Preconception care knowledge, range: 1 – 12, mean <math>\pm</math> SD: 8.36 <math>\pm</math> 2.33</b>		

\*Some women had more than one condition

### Relationship between overall preconception health behaviors and the associated factors

Pearson's correlation was performed to determine the relationship between the overall PCHB and years of education, pregnancy intention, and PCC knowledge. Point-biserial correlation was performed to determine the relationship between health risk and overall PCHB. The result (Table 4) showed positive significant associations of the overall PCHB with pregnancy intention ( $r = 0.46$ ,  $P < 0.001$ ) and PCC knowledge ( $r = 0.23$ ,  $P = 0.03$ ). PCHB was not significantly associated with years of education or health risk.

**Table 4** Association between preconception health behavior (PCHB) and associated factors (N = 90).

Associated factors	Preconception health behavior		
	r*	P-value	Level of association
Education (yrs)	0.03	0.81	n/a
Pregnancy intention	0.46	0.01	Moderate
PCC knowledge	0.22	0.04	Low
Health risk	-0.01	0.92	n/a

Note: n/a = not applicable.

\* Pearson's correlation for overall PCHB and years of education, pregnancy intention, and PCC knowledge. Point-biserial correlation for overall PCHB and health risk and.

### Relationship between each of the preconception health behaviors with the associated factors

Pearson's Chi-square and Fisher's exact test was done to examine the relation between each of the behaviors including changing to a healthy diet, folic acid consumption, avoidance/cessation alcohol and betel nut consumption with the four factors. It was found that education was not significantly associated with any behaviors. Unexpectedly, health risk was also not significantly associated with any behaviors.

**Table 5** Relationships between each behavior with the associated factors (N = 90).

Factors	Behaviors			
	Change to healthy diet, n (%)	Folic acid consumption, n (%)	Avoidance/cessation of alcohol consumption, n (%)	Avoidance/cessation of betel nut consumption, n (%)
<b>Overall</b>	21 (23.30)	4 (4.40)	60 (66.67)	43 (47.80)
<b>Individual factors</b>				
<b>Education (yrs)</b>	$\chi^2 = 0.75$ , $p = 0.39$	$\chi^2 = 4.38$ , $*p = 0.05$	$\chi^2 = 1.09$ , $p = 0.30$	$\chi^2 = 0.17$ , $p = 0.68$
≤ 10yrs	9 (10)	0 (0.00)	33 (36.70)	21 (23.30)
> 10yrs	12 (13.30)	4 (4.40)	27 (30.00)	22 (24.40)
<b>Health risk</b>	$\chi^2 = 0.77$ , $p^* = 0.55$	$\chi^2 = 0.04$ , $p^* = 1.00$	$\chi^2 = 1.64$ , $p = 0.20$	$\chi^2 = 1.16$ , $p = 0.28$
No	18 (20.00)	3 (3.30)	45 (50.00)	36 (40.00)
Yes	3 (3.30)	1 (1.10)	15 (16.70)	7 (7.80)
<b>Pregnancy intention</b>	$\chi^2 = 24.73$ , $p < 0.01$	$\chi^2 = 4.58$ , $p^* = 0.04$	$\chi^2 = 8.04$ , $p = 0.01$	$\chi^2 = 0.39$ , $p = 0.54$
Unplanned	1 (1.10)	0 (0.00)	25 (27.80)	21 (23.30)
Planned	20 (22.20)	4 (4.40)	35 (38.90)	22 (24.40)
<b>PCC knowledge</b>	$\chi^2 = 0.01$ , $p^* = 1.00$	$\chi^2 = 9.27$ , $p^* = 0.01$	$\chi^2 = 3.80$ , $p = 0.04$	$\chi^2 = 1.54$ , $p = 0.22$
No	2 (2.20)	0 (0.00)	29 (32.20)	20 (22.20)
Yes	19 (21.10)	4 (4.40)	31 (34.40)	23 (25.60)

Note: P-value based on Pearson's Chi-square test except those with (\*) which was based on Fisher's exact test.

In terms of pregnancy intention, it was significantly associated with a change to healthy diet ( $\chi^2 = 24.73$ ,  $P < 0.01$ ), folic acid consumption ( $\chi^2 = 4.58$ ,  $P = 0.04$ ), and

avoidance/cessation of alcohol ( $\chi^2 = 3.8$ ,  $P = 0.04$ ) but not with avoidance/cessation of betel nut consumption.

Specific PCC knowledge regarding PCHB behaviors showed significant association with preconception folic acid consumption ( $\chi^2 = 9.27$ ,  $P = 0.01$ ) and avoidance/cessation of alcohol ( $\chi^2 = 3.8$ ,  $P = 0.04$ ) but not with a change to healthy diet or avoidance/cessation of betel nut consumption.

## Discussions and Conclusion

Findings from our current study revealed that majority of the women (82.2%) adopted at least one of the preconception health behaviors (PCHB) including changing to a healthy diet, folic acid consumption, avoiding alcohol and betel nut. The findings of the current study showed a much higher percentage of women involved in at least one of the PCHB than in many other studies done in other countries. In a study among 807 Brazilian women, only 15.9% were involved in the practice of at least one PCHB.<sup>44</sup> While a study by Olowokere et al. reported that only 34.1% of the sample reported practice of at least one of the PCHB.<sup>40</sup> A study by Patabendige and Goonewardene reported only 27.2% of the study participants were involved in the practice of PCHB.<sup>45</sup> The difference between our and these studies are obvious.

The reasons for the differences in the proportion of women engaging in PCHB between our and other studies could be the difference in the objectives of individual studies. Our current study aimed at examining both avoidance and cessation of health risk behaviors, whereas all previous studies examined only the cessation aspect of health risk behaviors or the change in behavior among these women.

Even with a high proportion of women engaging in at least one of these health behaviors (82.2%), a large variation among these behaviors was found. The behavior with the lowest proportion of engagement was the change to a healthy diet when planning for pregnancy (23.3%). This result was relatively consistent with a study done in Nigeria<sup>40</sup> and a study by Stephenson et al.<sup>31</sup> where 32.5% and 31.0% of the women reported changing to a healthy diet before pregnancy, respectively. This lower rate of women changing to a healthy diet in our study could be due to the misconception that women should start the change only during pregnancy and not in the preconception period. This

perception is however detrimental to the health of the pregnant women and the fetus.

Good nutrition is crucial even before the conception and during the first 12 weeks of pregnancy since woman's nutritional status during pregnancy depends on the availability of pre-conception nutritional reserve. This reserve includes particular micronutrients such as calcium and iron.

The other possible reason of a low rate of changing to healthy diet in our study could be due to the limited number of questions regarding diet. Even the practice of consuming fruits is usually not that common among Bhutanese people. As shown by the national health survey report, only 45% of the population consumed fruits on an average of 3.4 days in a normal week.<sup>16</sup> To better capture the truth, it is crucial to expand the set of questions to cover more kinds of healthy food.

Preconception folic acid consumption at least 4 weeks before conception was reported by only 4 participants (4.4%) in our study despite 47.8% of the pregnancy being planned. The lack of this particular behavior among Bhutanese women could be the most probable cause of the high prevalence of orofacial clefts reported in the country. The findings are similar to those in a study by Borges et al. where only 5.6% of the sample reported taking folic acid before pregnancy.<sup>44</sup> The reason given for not consuming folic acid before pregnancy by most of the participants in the current study were that they were not aware of such necessity and did not receive any information regarding folic acid supplement before.

The low rate of folic acid consumption at preconception was supported by a low level of PCC knowledge. We found that 68.9% of participants were not aware that taking folic acid before pregnancy can help prevent birth defects. This finding is consistent with a study by Mallard and Houghton, which reported that not receiving information regarding folic acid before pregnancy apparently decreased the likelihood of recommended folic acid supplement uptake among women with planned pregnancy.<sup>28</sup>

Our finding of the folic acid consumption rate of 4.4% was much lower than many other studies. In studies by Nilsen et al.<sup>29</sup>, Olowokere et al.<sup>40</sup> and Wilton and Foureur<sup>46</sup>, rates of preconception folic acid consumption at least one month before conception were 23.5%, 30.4% and 23.4%, respectively. This difference could be due to the advancement in the concept of PCC and good awareness

programs and policies regarding benefits of folic acid before conception in other countries compared to Bhutan.

In the current study, avoiding alcohol consumption was reported to be the highest adopted PCHB (66.7%). However, cessation of alcohol among the ones who consumed it once they planned to get pregnant was reported by only few women. From the 33 women reporting alcohol intake, only 9.1% stopped drinking when pregnancy was planned; while the majority (72.7%) stopped when they knew they were pregnant. The rest of participants (18.2%) reportedly continued to drink alcohol during pregnancy on an occasional, if not a daily, basis.

The rate of women stopping alcohol consumption when planning for pregnancy among women who drank in the current study was much lower than the results in other studies. In a study by Olowokere et al., 29.9% of the respondents who reported consuming alcohol before pregnancy stopped when planning for pregnancy.<sup>40</sup> Similarly in another study by Stephenson et al, 41% of the respondents reduced or stopped alcohol before pregnancy.<sup>31</sup> This difference in the findings could be due to a lack of knowledge regarding the ideal time to stop drinking alcohol if planning for pregnancy, as 44.4% of participants in our study were not aware that alcohol consumption should be stopped at least 3 months before conception.

In the current study, only 47.8% of participants avoided betel nut consumption. In addition, among the women who chewed betel nut, none of the women reported stopping when planning for pregnancy. Avoiding betel nut was the only behavior not associated with any of the factors. The lack of knowledge regarding the effects of betel nut on pregnancy and fetal health and that chewing betel nut should be avoided when a woman plans to get pregnant could be the possible reason for the finding. This low proportion of this behavior was supported by a low level of PCC knowledge, where only 46.7% of women were aware that women should quit chewing betel nut before pregnancy. This is consistent with the conclusion drawn from studies by Senn et al.<sup>25</sup> and Yang et al.<sup>26</sup> where poor knowledge about the adverse health effects of chewing betel nut was a significant contributor to the high prevalence of the substance use among pregnant women in Madang province, Papua New Guinea and Taiwan, respectively. The other possible reason could be that the practice of chewing betel nut among



Bhutanese women is a habit of great antiquity and common practice.

Only 47 women who did not stop or avoid chewing betel nut at preconception, 31.9% of them stopped chewing betel nut when they knew they were pregnant while 68.1% continued the behavior during their pregnancy. The reasons given for continuing betel nut consumption even during pregnancy was mainly its perceived benefits against nausea. This benefit was also found in a study done in Papua New Guinea<sup>25</sup>, where 28% of the women interviewed perceived that betel nut could control morning sickness. It was also a significant determinant of chewing behavior among the population of women studied.<sup>25</sup> Many of the women in the current study said that consuming betel nut during pregnancy helped control morning sickness and that encouraged them to consume even more during pregnancy.

In terms of the association between the practice of PCHB and various factors, Pearson's correlation showed that the overall PCHB was significantly associated with PCC knowledge ( $r = 0.23$ ,  $P = 0.03$ ) and pregnancy intention ( $r = 0.46$ ,  $P < 0.001$ ). This finding is in line with many previous studies. However, no demographic characteristics were associated with any PCHB practices.

Although many previous studies have indicated that there is a relationship between the educational level of the women and the practice of PCHB<sup>27,29-31</sup>, surprisingly the current study showed no association between educational level and adoption of any of the PCHB practices. However, years of education showed significant association with PCC knowledge ( $r = 0.26$ ,  $P = 0.01$ ). The results of the current study are consistent with a study done in South Eastern Nigeria<sup>32</sup>, a study among Iranian women<sup>34</sup> and a study by Hage et al.<sup>33</sup> where respondent's educational status was found associated with the awareness of PCC, but not with the actual practice of PCC or folic acid consumption. The possible reason for this finding could be that being educated does not necessarily mean that they will be having information regarding any of the PCHB or will practice it. The other possible reason could be a small sample size. In terms of implication, this finding could indicate that services and information related to preconception health should be provided by healthcare institutes not educational institutes so that women of every educational background could be targeted for providing information and promoting awareness regarding preconception health and its importance.

Health risk also did not show any significant relationship with any of the PCHB practices. This finding is in contrast with few previous studies reporting a significant association.<sup>29,31</sup> However, it is consistent with a few previous studies<sup>34,36,37</sup> where folic acid consumption and avoiding risk behaviors was not associated with a history of preterm birth, pregnancy loss or any relevant medical conditions. The lack of relationship in the current study could be due to a small number of women with relevant medical conditions and with history of adverse pregnancy outcome. This was because majority of the women were pregnant for the first time.

Most studies we reviewed showed a significant association between pregnancy intention and the practice of PCHB. Our study also showed a significant relationship between the practice of PCHB and the change to a healthy diet ( $P < 0.01$ ), avoiding alcohol consumption ( $P = 0.01$ ), and preconception folic acid consumption ( $P = 0.04$ ) but not with avoiding betel nut consumption.

Planned pregnancy was the only factor which was associated with the practice of most of the behaviors. The result was consistent with many previous studies, although the percentage of behavior change and folic acid consumption was much lower in the current study. Stephenson et al. found significant association between reducing or stopping alcohol intake, changing to a healthier diet and folic acid consumption before pregnancy with pregnancy intention.<sup>31</sup> In addition, Dobson et al. found that the proportion of women who used folic acid before conception was significantly higher among those who planned their pregnancy.<sup>38</sup> Nilsen et al. found that intending the pregnancy was a statistically significant determinant of preconception folic acid use.<sup>29</sup> Furthermore, in a systematic review by Delissaint and McKyer, it was concluded that women who intended their pregnancies were more likely to engage in PCHB including folic acid use.<sup>3</sup> A study by Borges et al. also found that pregnancy planning was the main determinant of preconception health behavior adoption.<sup>44</sup> Planning pregnancy provides time for the woman and couple to prepare for the pregnancy and acquire information that can benefit both pregnant women and fetal health.

Majority of women with unintended or unplanned pregnancy were not involved in any of the PCHB in the current study. Most of them reported continuing alcohol and betel nut consumption even after they knew they were pregnant. This finding is in accordance with previous studies

where it was found that women with unintended pregnancies were more likely to use illicit drugs and smoke, and not to take folic acid or multivitamins.<sup>47,48</sup>

Specific knowledge regarding each specific behavior showed different association with each behavior. Significant relationship was reported between preconception folic acid knowledge and folic acid consumption ( $P = 0.01$ ), revealing that women with PCC knowledge related to folic acid are more likely to consume it before conception. This finding is consistent with a study by Mallard and Houghton<sup>29</sup> where increasing knowledge of folic acid supplement recommendations were linearly associated with folic acid supplement use. PCC knowledge related to alcohol intake also showed a significant association with avoiding alcohol use in the preconception period ( $P = 0.04$ ). This finding is consistent with a study by Esposito et al. where women who correctly knew about the maternal risk factors in pregnancy like alcohol reported avoiding it during pregnancy.<sup>9</sup> PCC knowledge regarding other specific behaviors did not show any association with adoption of the behavior. PCC knowledge related to betel nut consumption showed no significant association with avoiding its use. PCC knowledge related to healthy diet was also found not associated with the change to healthy diet before pregnancy. Although 91.1% of the participants reported being aware that adopting healthy dietary practices before pregnancy leads to a better pregnancy outcome, only 23.3% reported changing to healthy diet before pregnancy.

In terms of implication, this study provided a better understanding about the concept of preconception care in the country of Bhutan and also about the preconception health behaviors and the factors associated with. Nurses and other health care providers who have a direct contact with women of child-bearing age has an immense role in enhancing their knowledge and awareness regarding the preconception health behaviors and its importance on their health during pregnancy as well as the child's health. Women in child bearing age should be assessed for their reproductive life plan. They should also be encouraged to practice healthy behaviors to have a healthy pregnancy and healthy child. The intervention should be coordinated with the policy makers in developing policy related to preconception health. The intervention should also help create awareness programs regarding preconception health behaviors focusing exclusively on benefits of folic acid and

adverse effects of betel nut on child and maternal health. The outreach to women of child bearing age across the whole country could help reduce the prevalence of birth defects and burden of care resulting from having unhealthy babies with congenital abnormalities and other associated problems.

Our study was not free of limitations. Firstly, though the data collection was done in an area that could represent the whole country, generalizing the findings to other parts of the country might be limited. This was because the study setting is a high-level referral hospital which of course is different from a large number of other hospitals across the country. Secondly, although the study focused on the major and key behaviors to be examined, not including other components like preconception visit to a health care provider and preconception screening for HIV, anemia, and other chronic diseases could be another limitation. We recommend future studies examining behaviors of reproductive age women to overcome this limitation.

In conclusion, the findings of the study suggests that Bhutanese women's involvement in adoption of at least one of the PCHB is quite high but when each behavior was examined individually, it showed much lower involvement. Preconception folic acid consumption was the lowest PCHB adopted which could be the probable cause of high prevalence rate of orofacial clefts in the country. The results showed significant relationships between pregnancy intention and overall behavior and each of specific behaviors including healthy eating, folic acid consumption and avoiding/cessation of alcohol consumption among Bhutanese women. PCC knowledge regarding preconception folic acid supplementation and alcohol intake was also found to be significantly related to preconception folic acid intake and avoiding alcohol use, respectively. The overall PCC knowledge was also found associated with the practice of PCHB. Avoidance and cessation of betel nut use was the only behavior which did not show association with any of the factors. Therefore future interventions should aim at improving the PCC knowledge, encouraging planned pregnancy and creating awareness regarding the effects of chewing betel nut on the pregnant women and child health. The interventions should target women of all medical and educational background.

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