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Employment and Nutritional Status Among Women in Rural Nepal

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Abstract

This study sought to assess the impact of part-time employment on the nutritional status of women in rural Nepal. We used longitudinal data from a prospective cohort of women in the Sarlahi District of southeastern Nepal to assess whether part-time employment was associated with a change in mid-upper-arm circumference (MUAC) between baseline and five-years. The women enrolled in the study (n =715) had applied for part-time employment distributing weekly vitamin A supplements to married women of childbearing age. Over the five-years of follow-up, women received 900 Nepalese rupees ($15 USD) per month, for approximately five hours of work per week. The women who were hired (n =324) were younger and better educated than those who were not hired (n =391), but were otherwise similar. After baseline adjustments, change in MUAC (in cm) (β = 0.08; 95 % CI: -0.20, 0.36) was not associated with employment. Also, changes in MUAC over time were inversely related to baseline MUAC, with better nourished women gaining less (MUAC of 23 - 24.99: β = -0.83; 95% Confidence Interval [CI]: -1.18, -0.48; MUAC of ≥ 25: β = -0.99; 95% CI: -0.99, -0.54) compared to thin women (MUAC <21). In this sample, women employed part-time did not have improved nutritional status as compared to their unemployed counterparts. Future research should explore the impact of women's employment on the nutritional status of other members of the household, particularly children, and among women employed full-time.

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Introduction

A common tenant in economic development is that participation among women in income generating activities often results in improved health and nutrition outcomes among themselves as well as their children,[1-5] as women and men may have different preferences for allocating food and nonfood resources.[6,7] Therefore, many interventions that aim to alleviate poverty and improve nutritional status in low- and middle-income countries (LMIC) target women as their main beneficiaries. Prior research has explored the impact of cash transfer and microfinance programs on nutritional status,[1-5,8-11] however, the association between women's employment and nutritional status in LMIC is less well understood.

Several studies that examine similar relationships report a positive relationship between steady income from employment and nutritional status.[3,4,12-15] Steady and formalized work among women may accord benefits such as improved dietary diversity and well-being among themselves as well as other household members. For example, in a study of urban Filipino women, the quality of diet improved among employed women.[15] Similarly, in a random sample of approximately 900 households in rural Bangladesh, women in a cash-for-work program spent more money on food and their households consumed more fruit and protein-rich food (e.g. fish, meat, eggs and milk).[4] Employment may also enhance women's ability to independently access financial resources and increase their savings[2] as well as increase their control and influence over household decision-making processes[15], thus resulting in improved nutritional status. However, it is unclear if the positive effects of income or improved socioeconomic status (SES) are offset by negative time allocation effects among women participating in informal work or those with inadequate childcare support.[13,16-19]

This study was part of a larger randomized controlled community trial, which aimed to assess the impact of a weekly dose of vitamin A or beta-carotene delivered to women of childbearing age in rural Nepal. This steady part-time employment offered the opportunity to better explore the extent to which women's employment may impact the nutritional status among women in LMIC, by comparing those who received income from employment, with women who applied for the job but were not hired. Complementing a previous analyses by Katz and colleagues[20], these analyses follow the same women over a five-year period and tests the hypothesis that employed women have a greater, positive change in nutritional status, as measured by mid-upper-arm circumference (MUAC). Evidence suggests that women are increasingly entering formalized employment in LMIC,[21] therefore, a better understanding of the association between women's employment and nutritional status is critical and may

allow for informed development of policy and intervention strategies to support this trend.

Methods

Study Population

This prospective cohort study followed women over a five-year period that applied for part-time employment during December 1992 through January 1993. Additional study details are described elsewhere.[2,20] Briefly, employees were selected based on the results of a reading and writing test, relevant work experience, and an interview. Women made weekly visits to the homes of neighboring women to provide supplements, record pregnancy status, and record the receipt of supplements. The women received approximately 900 Nepalese rupees ($15 USD) per month for an estimated five hours of work per week.

Study staff administered the baseline questionnaire during the job interview application and interview process and prior to their selection for employment. Using a structured questionnaire, women were asked to provide information on demographic and socioeconomic characteristics, literacy, education, caste, decision-making, and time spent on various household activities and tasks. Total weekly household food expenditures were ascertained (collected in Nepalese rupees), as well as for specific foods such as meat, clarified butter (ghee), fish, eggs, milk, and vegetables. The MUAC of all applicants was measured using a Ross insertion tape by trained anthropometrists, following standard procedures.[22] Women who completed the baseline questionnaire were subsequently contacted for follow-up and re-interviewed two- and five-years later. Using a structured questionnaire, similar information regarding demographic and socioeconomic features and household food expenditures were obtained during follow-up. MUAC was measured in the same manner as at baseline. Verbal consent for participation was sought from each respondent. Interviews and assessments were conducted only after consent was obtained. Ethical approval for the study was given by the Joint Committee on Clinical Investigation of the Johns Hopkins School of Medicine and by the Nepal Health Research Council.

The original sample included 870 women (350 employees and 520 non-employees). An available case analysis approach was used to handle missing data, whereby all cases for MUAC and employment status (the primary variables of interest) were observed. Women with a missing MUAC value at baseline or five-years (n =22) or missing employment status (n = 2) were excluded. Excluded cases also included women who were lost to follow-up (n = 113), died (n = 6), or changed employment status during the study (n = 9). To prevent highly atypical observations from influencing the primary results, those with an extreme value for MUAC were also excluded (n=3). The analytic sample

included 715 women, 324 employed women and 391 unemployed women, representing 82 percent of the baseline sample.

Dependent Variable

Prior research has established MUAC as an appropriate indicator of women's nutritional status in non-pregnant women because of its high correlation with women's body mass index (BMI).[23-25] Similarly, the accuracy of MUAC in screening for underweight is well-documented; [26,27] recent estimates suggest 89% sensitivity and 71% specificity in a sample of Asian women.[28] For these analyses, a summary measure was created to represent the change in MUAC between baseline and five-years, which served as the primary dependent variable. Change in MUAC was modeled as a continuous variable in centimeters.

Independent Variables

Unchanged employment status at baseline and five-years was used as a surrogate indicator for consistent part-time employment throughout the five-year period of follow-up. Using appropriate cutoffs, categorical variables were created for maternal education (no education, 1 to 9 years of schooling, 10 years of schooling or more), MUAC (< 21 centimeters (cm), 21.0 – 22.9 cm, 23.0 – 24.9 cm, 25 cm or more), parity (1-2 births, 3-5 births, more than 5 births), age (< 20 years, 20-29 years, 30-39 years, 40-49 years, 50 or more years) and household ownership (quintiles based on 17 items where quartile 1 indicates those with few items owned and quartile 4 represents ownership of more items).

Confounders and Effect Measure Modifiers

Factors that we hypothesized might impact both employment and change in MUAC were initially selected a priori on the basis of their known association with maternal nutrition,[29] including characteristics such as age, education, parity, tobacco use, household composition, women's decision-making, and food expenditures. Based on previous literature[30] we hypothesized that the relationship between employment and change in MUAC may be different depending on a woman's baseline MUAC. Therefore, baseline MUAC (modeled as a categorical variable) was explored as an effect measure modifier using an interaction between baseline MUAC X employment. In addition, we explored the relationship between employment and nutritional status stratified by SES. SES was defined based on households' ownership of items (e.g. cattle, rice patties, bicycles, radios), as is common in LMIC. Those above the median score for household ownership of goods were categorized as high SES and those at or below the median score were defined as low SES.

Statistical Analysis

We used linear regression to explore the association

between employment and change in MUAC over the five -year period of follow-up. Maternal and household characteristics that were significantly different between the employed and unemployed group at baseline or were hypothesized confounders a priori were used to fit several multivariable models, regressing change in MUAC on employment status. Only age, education, smoking status, having household servants, and baseline MUAC were significant and retained in the final model. The interaction between baseline MUAC and employment was tested against the final model, but was not statistically significant, and therefore was removed.

Multivariable linear regression models were checked by studentized residuals, variance inflation factors, and leverage. In robustness checks, we tested whether results would substantively change if influential points were excluded. The data are presented as crude and adjusted mean changes for the primary outcome. All analyses were performed using Stata version 13.1. Alpha for main effects was set to 0.05 and to 0.10 for the interaction.

Results

Table 1 displays key demographic, household, and economic characteristics of the sample. The women who were hired were significantly younger than those who were not (25.18 versus 29.76 years; $p < 0.001$). They were also more likely to be literate ($p < 0.001$), have more years of formal schooling ($p < 0.001$), have household servants ($p < 0.001$); be multiparous ($p < 0.001$) and to make decisions within the household. Only age, education, smoking status, and having household servants remained significantly different between the employed and unemployed women at baseline in the multivariable model. Those who were hired and those who were not hired were comparable with respect to caste, household size, household ownership of items, and food and non-food expenditures. The distribution of MUAC was comparable in the two groups of women ($p = 0.31$). The average MUAC was 22.8 cm among those who were hired and 22.9 cm among those who were not.

At the five-year follow-up, 29 of the 391 women (7.1 percent) who had not been employed by the project reported that they had been employed in other jobs for which they were paid cash. Similarly, 22 of the 324 (6.8 percent) employed women reported additional cash employment. However, the amount of the cash payments these women received was not determined and additional cash employment was not associated with change in MUAC ($\beta = -0.09$, 95% Confidence Interval [CI] = -0.58, 0.41) (data not shown).

After adjustment for the baseline differences, employment was associated with a non-significant increase in change in MUAC ($\beta = 0.08$; 95% CI: -0.20, 0.36) (Table 2). As hypothesized, those women with a

Table 1. Baseline Characteristics

	Employed (n=324)	Unemployed (n=391)	p value[1]
	n (%)	n (%)	
Age (years)[2]	25.18 ± 6.09	28.76 ± 7.98	<0.001
Education			
No schooling	6 (1.85)	123 (31.46)	<0.001
1-9 years of schooling	242 (74.69)	218 (55.75)	
≥ 10 years of schooling	76 (23.46)	50 (12.79)	
Literacy	317 (98.14)	311 (79.74)	<0.001
MUAC (centimeters)			
< 21	51 (15.74)	58 (14.83)	0.309
21.0 - 22.9	126 (38.89)	150 (38.36)	
23.0 - 24.9	108 (33.33)	117 (29.92)	
≥ 25.0	39 (12.04)	66 (16.88)	
Smoking[3]	8 (2.47)	52 (13.30)	<0.001
Parity[2]	1.11 ± 0.63	1.28 ± 0.60	<0.001
Household Size[2]	7.35 ± 3.80	7.21 ± 3.64	0.631
Caste[3]			
Brahmin	99 (30.56)	114 (29.23)	0.248
Chhetri	56 (17.28)	54 (13.85)	
Vaishya	157 (48.46)	195 (50.00)	
Shudra	7 (2.16)	12 (3.08)	
non-Hindu	5 (1.54)	15 (3.85)	
Household Servants	113 (34.88)	77 (19.69)	<0.001
Household Ownership Scale[4]			
Quartile 1	51 (15.74)	80 (20.46)	0.249
Quartile 2	93 (28.70)	121 (30.95)	
Quartile 3	90 (27.78)	96 (24.55)	
Quartile 4	90 (27.78)	94 (24.04)	
Food Expenditures[5]			
All Food	316 (97.53)	374 (95.65)	0.173
Meat	197 (62.35)	255 (65.22)	0.426
Ghee	152 (46.91)	159 (40.66)	0.093
Fish	133 (41.05)	159 (40.66)	0.917
Eggs	86 (26.54)	101 (25.83)	0.829
Milk	169 (52.16)	181 (46.29)	0.118
Vegetables	296 (91.36)	362 (92.58)	0.547
Women's Decision Making			
Buying Foods	115 (35.49)	176 (45.01)	0.010
Selling Foodstuffs	59 (36.20)	104 (63.80)	0.008
Buying Children's Clothing	111 (34.26)	169 (43.22)	0.015
Children Seeking Medical Care	145 (44.75)	212 (54.22)	0.012
Borrowing Money	140 (43.21)	197 (50.64)	0.048

Missing values: age (n=3) literacy (n=2); caste (n=1); food expenditure (n=17); meat expenditure (n =8); ghee expenditure (n =8); fish expenditure (n =8); egg expenditure (n =8); milk expenditure (n =9); vegetable expenditure (n =4); borrowing money (n=2).

[1] Based on $\chi 2$ test for binary outcomes or *t*-test for continuous data
[2] Mean ± standard deviation
[3] p-value determined using fishers exact test due to small cell sizes
[4] Score based on 17 items where quartile 1 indicates those with few items owned with quartile 4 representing ownership of more items
[5] Presented as a dichotomous outcome indicating if money spent during the past week in Nepalese rupees

Table 2. Multivariable Linear Regression Results of Change in Mid-Upper-Arm Circumference (in cm) Between Baseline and Five Years

	Change in Mid-Upper-Arm Circumference[1] (n=715)	
	β (95% Confidence Interval)	**p value**
Employment Status	0.08 (-0.20 0.36)	0.58
Age (years)[2]		
< 20	Reference	
20 – 29	0.39 (-0.12, 0.89)	0.13
30 – 39	0.67 (0.13, 1.20)	0.01
40 – 49	0.29 (-0.48, 1.07)	0.46
≥ 50	0.16 (-1.11,1.43)	0.81
MUAC (centimeters)[2]		
< 21	Reference	
21-22.9	-0.25 (-0.58, 0.09)	0.15
23-24.99	-0.83 (-1.18, -0.48)	<0.001
≥ 25	-0.99 (-1.44, -0.54)	<0.001
Education		
No schooling	Reference	
1-9 years	0.11(-0.24, 0.45)	0.54
≥ 10 years	0.59 (0.12, 1.06)	0.01
Smoking	-0.54 (-0.97, -0.10)	0.02
Household Servants	-0.10 (-0.38, 0.19)	0.51

[1] Adjusted for age, education, smoking status, having household servants, and baseline MUAC, using robust standard error

[2] Age was modeled as categorical variable as it was not linearly associated with change in MUAC

higher baseline MUAC value gained less in arm tissue over time than those with a baseline MUAC < 21 cm (MUAC 23 - 24.99: β = -0.83; 95% CI: -1.18, -0.48; MUAC ≥ 25: β = -0.99; 95% CI: -1.44, -0.54). Similarly, those women with 10 or more years of schooling had a greater positive change in MUAC as compared to those with no schooling (β = 0.59, 95% CI: 0.12, 1.06). Those women who smoked at baseline had a significantly lower change in MUAC as compared to those women who did not smoke (β = 0.54; 95% CI: -0.97, -0.10).

Overall, results were similar when stratified by SES. After adjustment for baseline differences, employment was not significantly associated with change in MUAC among low SES (β = -0.05; 95% CI: -0.46, 0.37) nor high SES (β = 0.18; 95% CI: -0.21, 0.57) women (Table 3). Those women with a baseline MUAC > 25 cm exhibited the smallest increase in MUAC compared to those with a baseline MUAC < 21 cm (low SES: β = -0.93; 95% CI: -1.63, -0.24; MUAC ≥ 25 cm: β = -1.10; 95% CI: -1.74, -0.47). High SES women whose baseline MUAC was 23-24.99 cm also had a significantly lower change in MUAC. Among low SES women, education ≥ 10 years (β = 1.04; 95% CI: 0.38, 1.70) and smoking (β = -0.63; 95% CI: -1.17, -0.09) were significantly associated with change in MUAC. Robustness checks indicated that without influential points, the association between employment and change in MUAC changed direction (i.e. positive to negative), though results were not statistically significant (β = -0.53, 95% CI: -2.99, 1.93).

Discussion

This study compared women with themselves before and after five-years of part-time employment, controlling for observed baseline differences and hypothesized confounders. In this sample of rural Nepalese women, part-time employment was not associated with a change in nutritional status, as measured by MUAC. Consistent with previous findings that document and inverse relationship between baseline MUAC and weight gain,[30] we find that women with a higher baseline MUAC value had a significantly lower change in MUAC during follow-up.

Despite being well correlated with BMI, few studies have used MUAC to explore the impact of women's employment on nutritional status. In particular, Mascie-Taylor and colleagues[4] explored the impact of a cash-for-work program on improved nutritional status among women in rural Bangladesh. Results indicated that women in the intervention group increased in MUAC (mean +2.29 mm), whereas MUAC among women in the control group decreased. The authors indicated that participants worked approximately full-time; the program provided approximately 2.6 million person-days of paid work to men and women from September to December 2007. Notably, we may not have observed a

Table 3. Multivariable Linear Regression Results of Change in Mid-Upper-Arm Circumference (in cm) Between Baseline and Five Years by Socioeconomic Status

	Low Socioeconomic Status (n= 345)		High Socioeconomic Status (n= 370)	
	β (95% Confidence Interval)	p value	β (95% Confidence Interval)	p value
Employment Status	-0.05 (-0.46, 0.37)	0.82	0.18 (-0.21, 0.57)	0.36
Age (years)[2]				
< 20				
20 – 29	0.72 (-0.03, 1.45)	0.06	0.23 (-0.44, 0.90)	0.50
30 – 39	0.83 (0.06, 1.60)	0.04	0.76 (<0.01, 1.53)	0.05
40 – 49	0.47 (-0.64, 1.59)	0.41	0.08 (-1.03,1.19)	0.89
≥ 50	0.37 (-1.69, 2.44)	0.36	-0.07 (-1.43, 1.28)	0.91
MUAC (centimeters)[2]				
< 21				
21-22.99	-0.17 (-0.64, 0.31)	0.49	-0.30 (-0.78, 0.18)	0.22
23-24.99	-0.49 (-1.01, 0.03)	0.07	-1.12 (-1.61, -0.64)	<0.001
≥ 25	-0.93 (-1.63, -0.24)	<0.001	-1.10 (-1.74, -0.47)	0.001
Education				
No schooling				
1-9 years	0.25 (-0.20, 0.69)	0.27	-0.34 (-0.94, 0.26)	0.27
≥ 10 years	1.04 (0.38, 1.70)	<0.001	0.06 (-0.67, 0.79)	0.88
Smoking	-0.63 (-1.17, -0.09)	0.02	-0.33 (-1.10, 0.44)	0.40
Household Servants	-0.24 (-0.76, 0.28)	0.36	-0.13 (-0.50, 0.23)	0.47

[1] Adjusted for age, education, smoking status, having household servants, and baseline MUAC, using robust standard error

[2] Age was modeled as categorical variable as it was not linearly associated with change in MUAC

significant association between employment and nutritional status among our sample in Nepal because the employment was part-time.

In addition, Bisgrove and colleagues[15] report differential implications of employment by SES; in particular, improved diet was greater among women from low-income households. As noted by Katz and colleagues in previous work,[20] the women who applied for the part-time employment in Nepal were better educated and came from higher SES backgrounds than the general population of Sarlahi. For example literacy was very high among both women who were employed (98 percent) and those not employed (80 percent) by the study, while the overall literacy rate among women of childbearing age in Sarlahi was 14 percent at the time this study was conducted.[31] Similarly, a considerable segment of this population was from the highest caste (Brahmin).

Intra-household food allocation practices may also play a role.[32,33] In a study of intra-household food allocation in rural Nepal, women had a late position in household serving order and often allocated special foods to males and children.[32] This study also reported that women had a lower total energy intake, as compared to their male counterparts. It is possible that increased maternal income translates into higher quality foods and a greater quantity of food for other household members, but not for the women themselves. However, indicators of nutritional status among others in the household were not measured at five-year follow-up.

The initial analysis of Katz and colleagues[20] suggested that longer follow-up might result in impacts on nutrition that were not evident after two-years of part-time employment. However, these five-year follow-up results offer an alternative hypothesis; maternal part-time employment alone may not result in improved nutritional status. It may be that additional cash-income is spent on non-food expenditures, such as child health and education. A complementary analysis looked at the impact of employment (among these same women) on family health and economic well-being.[2] In particular, employed women were more likely to save cash, buy jewelry, and buy certain discretionary household goods, as compared to those who were not hired.[2] Expenditures on children's clothing also increased among employed women, and their children were more likely to be in private schools at follow-up.

Limitations of this study warrant consideration. It is possible that there were changes in other anthropometric indicators, such as absolute weight or BMI. However, additional indicators were not measured in this sample. MUAC was only collected among the mothers at follow-up, prohibiting the exploration of the impact of maternal employment on the others members of the household, primarily children. Other studies have suggested that increased maternal income may improve

diet diversity among children.[4,13] However, dietary consumption and total energy intake was not explored in this sample. An additional limitation of this longitudinal study design is the lost-to follow-up among participants, introducing the possibility that those who remain in the sample are different than those who were lost. However, to result in biased coefficients, the relationship between employment and change in MUAC would have to be different between those observed and those lost and we have no reason to believe this would be the case. We have a relatively high retention, with 82 percent of the original sample.

Conclusions

Despite results suggesting that part-time employment is not associated with changes in the nutritional status of women, women's employment may have other benefits in LMIC settings, including improved decision-making power among women and increased household SES. Future research should explore if these pathways impact the nutritional status of other members of the household and investigate this relationship among women employed full-time.

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