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Epidemiology of micronutrient deficiencies in agricultural reproductive-aged female workers in Southeastern Anatolia, Turkey

Micronutrient deficiencies in agricultural women

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Abstract

Deficiencies of micronutrients, especially iron, folate, and vitamin B_{12}, among women of reproductive age are known causes of serious maternal and child health problems.The purpose of this study was to find out the prevalence of anemia, and vitamin B_{12} and folate deficiencies and risk factors among reproductive-aged married women in an agricultural population. A cross-sectional study was conducted on the random sample of 749 reproductive age women in nine provinces of the southeastern Anatolia region of Turkey in 2013. Chi-square test and logistic regression were applied for the data analysis. The results indicated that 36%, 24.3%, and 1.6% of the women had anemia, vitamin B_{12} and folate deficiencies, respectively. Seasonal agricultural workers, illiterate women, and those living in rural areas had a higher prevalence of anemia, and micronutrient deficiencies after analysis of the confounders. These data indicated the necessity of a public health program for the prevention and early diagnosis of micronutrients including enhanced biological surveillance systems, developed B_{12} monitoring program, and community empowerment programs to decrease micronutrients deficiencies in agricultural reproductive age women.
Keywords: Anemia, B12 and folate deficiencies, Agricultural reproductive aged women

Introduction

Anemia is a global public health problem, affecting 1.62 billion people, causing 115,000 maternal and 591,000 perinatal deaths per year, cognitive and physical development delays, loss of productivity from impaired work capacity, increased susceptibility to infection, and a substantial economic burden (Balarajan *et al.* 2011; Ezzati *et al.* 2004; McLean *et al.* 2009; Ramakrishnan and Huffman 2008; Ramakrishnan *et al.* 2012). The World Health Organization (WHO) contends that the micronutrients iron, iodine, zinc, folic acid, and vitamin A are among the most critical for maternal and child health (Ramakrishnan *et al.* 2012). It is assumed that 50% of anemia cases are due to iron deficiency, and this is considered to be among the most contributing factors to the global burden of disease (Balarajan *et al.* 2011). The main risk factors for deficiencies, i.e. a low intake of micronutrients, poor absorption of iron from high-phytate diets or phenolic compounds; heavy blood loss as a result of menstruation or parasite infections; acute or chronic infections; and vitamins A and B_{12}, folate, or copper deficiencies (Balarajan *et al.* 2011; Ezzati *et al.* 2004; Gibson *et al.* 2010; McLean *et al.* 2009; Nguyen *et al.* 2014; Ramakrishnan 2002; Ramakrishnan and Huffman 2008; Ramakrishnan *et al.* 2012). Food-based approaches to increase micronutrient intake through food fortification and dietary diversification are important, sustainable strategies for preventing anemia in the general population. Therefore, strategies should be tailored to local conditions, taking into account the specific etiology and prevalence of anemia in a given setting and population group.

It is known that working conditions have a direct effect on lifestyle, and the relationship between lifestyle and premature mortality and morbidity. The International Labor Organization states that agriculture is the second largest employment field in the world, with a total employment rate of 35%, and the regional distribution of this rate is as follows: sub-Saharan Africa 59%, South Asia 53.5%, Southeast Asia and Pacific 44.3%, East Asia 36.9%, North Africa 27.8%, Southeast Europe 20.2%, Latin America 16.3%, and developed economies and the European Union 3.7%. Micronutrient deficiencies are a significant public health problem in many agricultural countries. Although the prevalence of anemia is estimated at 9% in countries with high development, Africa and Asia accounts for more than 85% of the absolute anemia burden in high-risk groups (Balarajan *et al.* 2011; McLean et al. 2009). On the other hand, agriculture is the most important sector for female employment in many countries, and especially in Africa and Asia (International Labor Office 2011).

In Turkey, 24.6% (6,143,000 persons) of the labor force are employed in the agriculture sector (Turkish Statistics Institution 2012). Agriculture preserves its importance in the world in terms of meeting food needs, providing input to industries, exports, and employment opportunities. According to the latest national health surveys, maternal and child health indicators are lower in Southeastern Anatolia region (SAR) than the general population in Turkey (Hacettepe University Population Studies Institution 2009). In this region, agriculture and animal husbandry are very common. In order to reduce regional health inequalities in terms of infant mortality (Goal 4), improvement of maternal health (Goal 5), and to control of communicable diseases (Goal 6) are recommended by the Millennium Development Goals, risk groups must be identified, and need-appropriate services should be improved based on micronutrient deficiencies.

This paper fills the gap in the literature by addressing two objectives: 1) to determine the overall prevalence of anemia, and vitamin B_{12} and folate deficiencies in agricultural reproductive-aged women, mainly in the southeastern Anatolian region of Turkey. 2) To identify the key determinants of anemia, B_{12}, and folate deficiencies. Knowledge of anemia and micronutrient deficiencies will help to design appropriate monitoring services by the primary healthcare units, and health education and counseling materials targeted at women health interventions.

Materials and methods

Study area

This study was conducted between January and April of 2013 in nine GAP provinces (Adıyaman, Batman, Diyarbakır, Gaziantep, Kilis, Mardin, Siirt, Şanlıurfa, and Şırnak). According to the 2012 census records, the total population of the SAR region was approximately 7,816,173 (Nearly one-tenth of the total Turkish population) and of that, 25% of the population was employed in agriculture and 49.5% of the agriculture workers were women (Pala and Dundar 2008). GAP is the one of the least developed regions of Turkey.

Study design

In this study, anemia, vitamin B_{12}, and folate analyses from representative multipurpose cross-sectional research data of the ‘SAR Agricultural Health Survey/2013’ conducted by authors collaboration with Harran University Scientific Research Council, and SAR Regional Development Administration was analyzed. This survey was approved by the Ethics Committee of the Faculty of Medicine at Harran University. The National Turkish Statistics Institution calculated the optimum sample size using a 95% confidence level, and selected the households using the probability proportional to size method. The cluster size was identified as 10 households working in agriculture. If there was more than one nonpregnant women of reproductive age, one woman was enrolled in the study randomly using the person selection method. Working in agriculture and animal husbandry was determined in 1128 households. A total of 93 women (8.8%) were rejected from enrollment in the study, or refused to give a blood sample, 41 (3.6%) were not found during home visits, and there was no appropriate person to interview in seven (0.6%) households. Therefore, this study was successfully conducted in 749 households with reproductive-aged women.

During home visits, the aim of the study was explained to the participants and an informed consent was obtained from each participant. Data were collected using a structured questionnaire that included sociodemographic information, including age, education level, type of work (seasonal migratory worker/family farmer), type of settlement, language spoken at home, sanitation conditions (accessibility of safe water, toilets, soap, and taps in the field area), having a family physician, and history of pregnancy by a face-to-face interview. The languages spoken at home were Kurdish, Arabic, and Turkish.

Blood samples

Blood was drawn from the antecubital vein and collected in amber-colored polypropylene tubes. The samples were transported on ice packs from the nine provinces to the laboratory at the Harran University Medical Hospital, for separation of the serum by centrifuging, within approximately 2 h. The serum was collected in eppendorf vials, labeled, and stored at –80 °C until the vitamin B_{12} and folate analyses.

For hematological investigations, 2 mL of venous blood from each study respondent was taken in a prenumbered vial containing EDTA (anticoagulant). All of the sample vials were sent to the central laboratory, where the hemoglobin estimation was done using the cyanmethemoglobin method, using a photoelectric colorimeter. For the interpretation of anemia, the cutoff point for the hemoglobin level was <12 g/dL). The severity of anemia was graded as mild (10 – <12 g/dL), moderate (7 – <10 g/dL), and severe (<7 g/dL) (Balarajan *et al.* 2011).

The status of the serum folate was assessed by estimating the serum folate using the standard radioimmunoassay method with the use of the Simul TRAC-SNB Radioassay Kit. Levels of less than 3 ng/mL were considered as indicative of folate deficiency. Serum vitamin B_{12} was estimated by the microbiologic method, and levels of less than 200 pg/mL were considered as indicative of poor vitamin B_{12} stores.

Statistical analysis

Data entry and analyses were performed using the Statistical Package for the Social Sciences version 11.5. The Kolmogorov-Smirnov test was used to assess normality. Descriptive analyses were used to report the demographic and socioeconomic characteristics of the study sample. Associations among the variables were assessed using crude odds ratios (OR), and 95% confidence intervals (CI) were calculated and chi square analyses were performed. After determining the association factors in a bivariate analysis, logistic regression was used to control the confounder factors (age, education level, ethnicity, developmental level, type of work, sanitation conditions) and to calculate adjusted odds ratios (95% confidence interval). All of the statistical tests were two-tailed and differences were considered significant at $P < 0.05$.

Results

Descriptive characteristics of the study sample

A total of 749 reproductive-aged nonpregnant female farmworkers were enrolled in this study. The mean age (±SD) of the female farmworkers was 35.8 ± 9.1 years. The mean (±SD) household size was 8.2 ± 3.5 persons. Approximately 55% of the participants were >35 years of age. More than half of the participants (57.5%) were illiterate, 27.5% completed primary school, 3.2% completed secondary school, 0.8% completed high school; 0.2% completed at least one year of higher education, and 10.3% had less than a primary school education. Of the participants, 38.3% were living in a poor family, 33.6% were seasonal migratory farmworkers, and 62.9% had 5 and more pregnancies. More than half the participants were of the Kurdish ethnic group (50.5%), 12.2% were Arabic, and 17.4% were Turkish.

Anemia, and vitamin B_{12} and folate deficiencies

The mean hemoglobin concentration was 12.2 ± 1.4 g/dL, vitamin B_{12} was 261.9 ± 92.9 pg/mL, and folate was 9.4 ± 4.6 mg/mL. As seen in Table 1, the overall prevalence of anemia among the studied women was 36%, of which 23.4%, 11.0%, and 1.6% had mild, moderate, and severe anemia, respectively. It was found that 24.3% and 1.5% of the women were deficient in vitamin B_{12}, and folate, respectively.

Insert Table 1

As seen in Table 2, the bivariate analyses revealed significant positive associations between micronutrient deficiency (B_{12}, folate deficiency) and low hemoglobin concentration, and educational level, type of work, type of settlement, sanitation facilities, having a family physician, and ethnicity ($P < 0.05$). There were no significant relation to the age of the women and size of the household ($P > 0.05$).

Insert Table 2 and 3

Multivariate logistic regression models showed that illiterate women (OR = 1.7; 95% CI = 1, 1–3, 1), female seasonal workers (OR = 1.7; 95% CI = 1, 1–3, 4), and those living in rural areas (OR = 2.5; 95% CI = 1, 1–5, 7) were more likely to have anemia and micronutrient deficiency when compared to their counterparts with a higher education, living in urban areas, and female family farmworkers, but there were no independent effects of the sanitation facilities, ethnicity, and having a family physician (Table 3).

Discussion

This paper is one of the first to describe anemia, and vitamin B_{12} and folate deficiencies among agricultural reproductive-aged women in the SAR region of Turkey, where maternal and child health indicators are lower than in other regions, based on representative samples at the individual level.

The prevalence of anemia was 36%, of which 23.4%, 11.0%, and 1.6% had mild, moderate, and severe anemia, respectively. The B_{12} deficiency was 24.3% and the folate deficiency was 1.5%. This study showed that according to the WHO classification, the prevalence of anemia was a moderate public health problem, at 20.0% to 39.9% in this population. The WHO Global Database on Anemia for 1993–2005, covering almost half the world's population, estimated the prevalence of anemia worldwide at 25%, i.e. 468 million nonpregnant women (30%) are estimated to be anemic, which is consistent with our findings. Laillou *et al*. conducted a survey in Vietnam and reported the prevalence of anemia, and vitamin B_{12} and folate deficiencies as 11.5%, 11.7%, and 1.7%, respectively (Laillou *et al.* 2012). Another cross-sectional study conducted by Pala and Dundar in Bursa reported prevalence results consistent with those of this study (32.8%) of anemia in reproductive-aged women (Pala and Dundar 2008). Pangrahi and Sahoo reported the prevalence of anemia as 60.8%, of which 39.6%, 20.0%, and 1.2% of women had mild, moderate, and severe anemia, respectively (Panigrahi and Sahoo 2011). Another cross-sectional study conducted by the Brihan Municipal Corporation in slum areas of Mumbai reported a high prevalence (82.2%) of anemia among nonpregnant women of reproductive age (Brabin *et al.* 2010). Another study reported the prevalence of anemia has ranging from 10%–50% world-wide (Heseker *et al.* 2009).

There are many studies on children, elderly, and pregnant women, but few studies are related to nonpregnant women and vitamin B_{12} deficiency. However, maternal and child health roots begin before the pregnancy period. For example, low maternal levels of vitamin B_{12} or folate appear to be an independent risk for neural tube defects (Heseker *et al.* 2009). Studies from Mexico and Guatemala have also found some degree of vitamin B_{12} deficiency, ranging from 20%–50% in many segments of the population (Heseker *et al.* 2009). The prevalence of vitamin B_{12} deficiency among refugees resettling in Australia from Iran, Bhutan, and Afghanistan was 16.5%, and anemia was 16.4%. (Benson *et al.* 2013). In another study of 326 refugees undertaking postarrival screening in Minnesota, Texas, and Utah, it was found that 27% of those from Bhutan and 12% from Somalia had Vitamin B_{12} deficiencies (Centers for Disease Control and Prevention 2011).

In this study, three major determinants for anemia, vitamin B_{12} and folate deficiencies were found. First, the prevalence of anemia in rural areas was 2.5 times higher compared to that of women living in urban areas. Second, seasonal agricultural workers had a higher prevalence, approximately two times higher. Third, a significantly higher prevalence was noted in women who were illiterate (1.7 times). Many researchers reported that, in most settings, anemia is socially patterned by education, occupation (e.g., agricultural workers), and residence. Women in low socioeconomic groups, the least educated, and living rural areas are have the greatest risk of exposure to risk factors for anemia and micronutrient deficiencies (Ghosh 2009; Massawe *et al.* 2002; Ngnie-Teta *et al.* 2009; Pathak *et al.* 2007; Raghuram *et al.* 2012; Rohner *et al.* 2013; Shamah-Levy *et al.* 2003). This might be explained by the obstacles to access health care services, unhealthy and substandard living conditions, and bad nutrition habits, including drinking tea with breakfast, and consuming unleavened bread.

Despite some limitations, the present study identified the prevalence of anemia, and vitamin B_{12} and folate deficiencies, and high risk groups in agricultural reproductive-aged married women according to the WHO recommendations to control micronutrient deficiencies. The high prevalence highlighted by this study reflects a profound health promotion program on nutrition, based on primary healthcare services and agricultural populations. A recent systematic review suggested that the promotion of agriculture and small-animal production as potentially promising and culturally relevant strategies to improve and diversify diets. On the other hand, micronutrient supplementation and food fortification are recommended in the Millennium Development Goals to eradicate poverty, decrease the rate of child mortality, improve maternal health status, and control communicable diseases. However, the consumption of fortified foods is confined largely to urban centers and many rural communities that typically rely on their own production may have limited access to fortified food products. Therefore, the promotion of food-based approaches, including improving agricultural practices and/or diversifying food production, combined with promoting better dietary practices, and hygienic husbandry is appropriate and needed (Bhutta *et al.* 2008; Dickey *et al.* 2002; Le 2003; Massawe *et al.* 2002).

In conclusion, the findings from this study provide valuable information that may be used to design better policies and intervention programs. The following recommended systematic and institutional steps are needed to control anemia and B_{12} deficiency to increase public health: 1) *enhanced biological surveillance systems* to gather and analyze data for the identification and monitoring of risk groups, and *improved behavioral surveillance* for asking advice from family physicians; 2) *developed B_{12} monitoring program* integrated with standard monitoring of the health of seasonal agricultural workers and reproductive-aged women twice a year, entered into a performance system for family physicians; 3) *community empowerment programs* such as peer education and lay health worker, and increase education levels based on reading and writing courses, and developed materials with basic nutrition knowledge by community health centers. All of these domains are likely to be of vital importance for prevention and intervention measures to increase the health status of women in the SAR region.

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The authors declare that they have no competing interests.

Authors' contributions

ZS was the principal investigator of the study and oversaw all aspects of the study design, implementation, and drafted the manuscript. NA carried out the biochemical analysis, and reviewed the manuscript. BA and AZK participated in the design of the study and field study. AK participated in the laboratory study, and coordinated the blood sample collection. ME participated in its design, and helped to draft the manuscript. All authors read and approved the final manuscript.

Key messages

- Anemia is a moderate public health problem in agricultural women population in SAR region.
- About one in every four reproductive-aged women has B12 deficiency.
- In agricultural reproductive-aged women population, seasonal migratory workers, illiterate womens, and woman living in rural areas are determined as high risk groups.
- B12 monitoring system should be established and improved biological and behavioral surveillance system for all reproductive aged women for anemia.

References

Balarajan Y., Ramakrishnan U., Ozaltin E., Shankar A.H. & Subramanian S.V. (2011) Anaemia in low-income and middle-income countries. *Lancet* **378**, 2123–2135.

Benson J., Phillips C., Kay M., Webber M.T., Ratcliff A.J., Correa-Velez I. *et al.* (2013) Low vitamin B12 levels among newly-arrived refugees from Bhutan, Iran and Afghanistan: a multicentre Australian study. *PLoS One* **8**, e57998.

Bhutta Z.A., Ahmed T., Black R.E., Cousens S., Dewey K., Giugliani E. *et al.* (2008) Maternal and Child Undernutrition Study Group: What works? Interventions for maternal and child undernutrition and survival. *Lancet* **371**, 417–440.

Brabin L., Nicholas S., Gogate A., Gogate S. & Karande A. (2010) Brihan Mumbai Municipal Corporation, population and reproductive health programme at Liverpool. High prevalence of anemia among women in Mumbai, India. [accessed on 2010 Nov 8]. Available from: [http://www.unu.edu/unupress/food/v193e/ch03.htm].

Centers for Disease Control and Prevention (2011) Vitamin B12 deficiency in resettled Bhutanese refugees --- United States, 2008--2011. *Morbidity and Mortality Weekly Report* **60**, 343–346.

Dickey V.C., Pachón H., Marsh D.R., Lang T.T., Claussenius D.R., Dearden K.A. *et al.* (2002) Implementation of nutrition education and rehabilitation programs (NERPs) in Viet Nam. *Food and Nutrition Bulletin* **23**, 78–85.

Ezzati M., Lopez A.D., Rodgers A.A. & Murray C.J.L. (2004) Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors. Geneva, Switzerland: World Health Organization.

Ghosh S. (2009) Exploring socioeconomic vulnerability of anaemia among women in eastern Indian States. *Journal of Biosocial Science* **41**, 763–787.

Gibson R.S., Bailey K.B., Gibbs M. & Ferguson E.L. (2010) A review of phytate, iron, zinc, and calcium concentrations in plant-based complementary foods used in low-income countries and implications for bioavailability. *Food and Nutrition Bulletin* **31**, S134–S1346.

Hacettepe University Population Studies Institution (2009) Turkish Demographic and Health Survey-2008, Ankara, Turkey.

Heseker H.B., Mason J.B., Selhub J., Rosenberg I.H. & Jacques P.F. (2009) Not all cases of neural-tube defect can be prevented by increasing the intake of folic acid. *British Journal of Nutrition* **102**, 173–180.

International Labor Office (2011) Global Employment Trends 2011. [accessed 8 June 2013]. [http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_150440.pdf].

Laillou A., Pham T.V., Tran N.T., Le H.T., Wieringa F., Rohner F. *et al.* (2012) Micronutrient deficits are still public health issues among women and young children in Vietnam. *PLoS One* **7**, e34906.

Le H.T (2003) Programs to improve production and consumption of animal source foods and malnutrition in Viet Nam. *Journal of Nutrition* **133**, 4006–4009.

Massawe S., Urassa E., Nystrom L. & Lindmark G. (2002) Anaemia in women of reproductive age in Dar-es Salaam, Tanzania. *East African Medical Journal* **79**, 461–466.

McLean E., Cogswell M., Egli I., Wojdyla D. & de Benoist B. (2005) Worldwide prevalence of anaemia, WHO vitamin and mineral nutrition information system, 1993–2005. *Public Health Nutrition* **12**, 444–454.

Ngnie-Teta I., Kuate-Defo B. & Receveur O. (2009) Multilevel modelling of sociodemographic predictors of various levels of anaemia among women in Mali. *Public Health Nutrition* **12**, 1462–1469.

Nguyen P.H., Nguyen H., Gonzalez-Casanova I., Copeland E., Strizich G., Lowe A. *et al.* (2014) Micronutrient intakes among women of reproductive age in Vietnam. *PLoS One* **9**, e89504.

Pala K. & Dundar N. (2008) Prevalence and risk factors of anaemia among women of reproductive age in Bursa, Turkey. *Indian Journal of Medical Research* **128**, 282–286.

Panigrahi A. & Sahoo P.B. (2011) Nutritional anemia and its epidemiological correlates among women of reproductive age in an urban slum of Bhubaneswar, Orissa. *Indian Journal of Public Health* **55**, 317–320.

Pathak P., Kapil U., Yajnik C.S., Kapoor S.K., Dwivedi S.N. & Singh R. (2007) Iron, folate, and vitamin B12 stores among pregnant women in a rural area of Haryana State, India. *Food and Nutrition Bulletin* **28**, 435–438.

Raghuram V., Manjula A. & Jayaram S. (2012) Prevalence of anaemia amongst women in the reproductive age group in a rural area in southern India. *International Journal of Biological and Medical Research* **3**, 1482–1484.

Ramakrishnan U., Grant F., Goldenberg T., Zongrone A. & Martorell R. (2012) Effect of women's nutrition before and during early pregnancy on maternal and infant outcomes: a systematic review. *Paediatric and Perinatal Epidemiology* **26**, 285–301.

Ramakrishnan U. & Huffman S. (2008) Multiple micronutrient malnutrition: what can be done? In *Nutrition and Health in Developing Countries*. (eds R.D. Semba, Bloem M, N.J. Totawa, pp. 365–391. Humana Press: New York.

Ramakrishnan U. (2002) Prevalence of micronutrient malnutrition worldwide. *Nutrition Reviews* **60**, 46–52.

Rohner F., Northrop-Clewes C., Tschannen A.B., Bosso P.E., Kouassi-Gohou V., Erhardt J.G. *et al.* (2013) Prevalence and public health relevance of micronutrient deficiencies and undernutrition in pre-school children and women of reproductive age in Côte d'Ivoire, West Africa. *Public Health Nutrition* **4**, 1–13.

Shamah-Levy T., Villalpando S., Rivera J.A., Mejia-Rodriguez F., Camacho-Cisneros M. & Monterrubio E.A. (2003) Anemia in Mexican women: a public health problem. *Salud Pública de México* **45**, 499–507.

Turkish Statistics Institution (2012) Address-based population registration system results. Publications of the Turkish Statistical Institute 2012 [Available from: http://www.turkstat.gov.tr/Start.do].

Table 1. Distribution of anemia, and vitamin B_{12} and folate deficiencies in 749 reproductive-aged married women in an agricultural population, Turkey

Nutrient	**N**	**%**
Anemia	**270**	**36.0**
Mild anemia (10 – <12 g/dL)	175	23.4
Moderate anemia (7 – <10 g/dL)	82	11.0
Severe anemia (<7 g/dL)	13	1.6
Vitamin B_{12} (serum vitamin B_{12} <200 pg/mL)	**163**	**24.3**
Folate (serum folate <3 mg/mL)	**10**	**1.5**
Anemia due to B_{12} deficiency	72	44.2
Anemia due to folate deficiency	7	3.0

Table 2. Distribution of anemia prevalence, B_{12}, and folate deficiencies according to the selected variables in 749 reproductive-aged married women in an agricultural population, Turkey

Independent variables	**Total**		**Anemia**		**B_{12} deficiency**		**Anemia, B_{12}, and folate deficiency**	
Age group	**n**	**%**	**n**	**%**	**N**	**%**	**n**	**%**
34 years and below	326	45.5	130	39.9	67	23.1	164	50.3
35 years and above	391	54.5	131	33.5	86	24.2	182	46.5
	X^2; P; OR (CI 95%)		*3.119; 0.07; 1.1 (0.9–1.4)*		*0.111; 0.79; 0.9 (0.7–1.2)*		*1.06; 0.316; 1.0 (0.8–1.0)*	
Size of household								
7 and below	357	47.7	122	34.2	75	21.9	164	45.9
8 and above	392	52.3	148	37.8	88	26.7	199	50.8
	X^2; P; OR (CI 95%)		*1.040; 0.38; 0.9 (0.7–1.1)*		*2.12; 0.14; 0.8 (0.6–1.0)*		*1.74; 0.187; 1.0 (0.9–1.2)*	
Education level								
Illiterate	516	68.9	199	38.6	121	26.7	271	52.5
Primary school and above	233	31.1	71	30.5	42	19.4	92	39.5
	X^2; P; OR (CI 95%)		***4.56; 0.03; 1.3 (1.1–1.9)***		***4.25; 0.03; 1.4 (1.1–1.9)***		***10.91; 001; 1.3 (1.1–1.6)***	
Type of work								
Family farmers	497	66.4	185	37.2	87	20.5	230	45.2
Seasonal migratory workers	252	33.6	85	33.7	76	30.9	133	54.8
	X^2; P; OR (CI 95%)		*0.88; 0.34; 1.1 (1.1–1.3)*		***9.20; 0.02; 1.2 (1.1–1.4)***		***4.836; 005; 1.3 (1.2–1.8)***	
Type of settlement								
Urban	78	10.4	20	25.6	13	18.6	28	35.9
Rural	671	89.4	250	37.3	150	25.0	335	49.9
	X^2; P; OR (CI 95%)		***4.09; 0.04; 1.2 (1.1–1.4)***		*1.39; 0.23; 0.7 (0.4–1.2)*		***5.506; 0.19; –1.3 (1.1–1.5)***	
Sanitation conditions								
Good	407	54.3	33	32.0	23	27.7	185	45.5

Bad	342	45.7	237	36.7	140	23.8	178	52.0
	X^2; P; OR (CI 95%)		*0.83; 0.36; 1.0 (0.7–1.2)*		*0.62; 0.43; 0.9 (0.8–1.1)*		***3.23; 0.04; 1.1 (1.01–1.3)***	
Having a family physician								
Yes	598	79.8	218	36.5	122	22.5	289	48.3
No	151	20.2	52	34.4	141	31.8	74	49.0
	X^2; P; OR (CI 95%)		*0.21; 0.64; 0.9 (0.4–1.2)*		***4.87; 0.02; 1.4 (1.1–1.8)***		*0.02; 0.88; 1.0 (0.8–1.2)*	
Language at home								
Turkish	130	17.4	40	30.8	25	19.5	56	43.1
Kurdish	525	70.1	186	35.4	112	24.8	249	47.4
Arabic	91	12.1	43	47.3	25	72.2	56	61.5
	X^2; P; OR (CI 95%)		***6.61; 0.03; 1.3 (1.1–1.6)***		*2.25; 0.32; 1.1 (0.9–1.3)*		***7.29; 0.01; 1.5 (1.1–1.9)***	
Total	**749**	**100.0**	**270**	**36.0**	**163**	**24.3**	**363**	**48.5**

Table 3. Summary result of the logistic regression

Independent variables	B	SE	Wald	P	EX(B)	CI 95%
Education level (*Illiterate*)	0.529	0.299	3.625	**0.047**	**1.7**	**1.1–3.1**
Type of work (*Seasonal female farmworker*)	0.633	0.401	4.492	**0.034**	**1.9**	**1.1–3.4**
Sanitation (*Bad*)	0.257	0.403	0.406	0.524	1.3	0.6–2.9
Language at home (*Arabic*)	0.505	0.309	2.676	0.102	1.7	0.9–3.0
Type of settlement (*Rural*)	0.896	0.431	4.326	**0.038**	**2.5**	**1.1–5.7**
Having a family physician (*35 and older*)	–0.263	0.403	0.400	0.217	0.8	0.3–1.7
Constant	–1.448	0.654	4.900	0.039		