The Pharma Innovation Journal 2022; SP-11(3): 858-863

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(3): 858-863

www.thepharmajournal.com
Received: 04-01-2022
Accepted: 06-02-2022

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Assessment of work related health hazards faced by female workers in vegetable cultivation

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Abstract
According to the Indian Fiscal commission, "Agriculture is not merely an occupation; it is a way of life which for centuries has shaped the thought and outlook of many millions of people." Swaminathan, the famous agricultural scientist, describes that it was women who first domesticated crop plant and thereby initiated the art and science of farming. The existing research is highlighting the health hazards experienced by women in various activities of vegetable cultivation in Assam. To conduct the study four villages from the North West Development Block of Jorhat district was selected purposively and 300 female workers were selected by following proportionate random sampling method. The findings depicted that weeding and harvesting activities were more hazardous than the other activities of vegetable cultivation. Among all the selected health hazards, 'cuts' was ranked (mean value: 3.93) first in harvesting operation.

Keywords: work related health hazards, vegetable cultivation, female workers

Introduction
As agricultural work is carried out in the countryside, the workers are subjected to the health hazards of a rural environment as well as those inherent in the specific work processes involved. Most agricultural work is carried out in the open air and consequently agricultural workers are dependent on weather changes to perform their tasks. This factor not only undermines the efficiency of the operations, but also influences working conditions, making them difficult and dangerous (e.g. a rainstorm while harvesting, gusts of wind when pesticides are being applied, etc). In its strict sense, a hazard is simply something which could potentially be harmful to a person's life or well-being. However, hazards are sometimes classified by the combination of the likelihood of the hazard turning into a health effect and by the seriousness of that effect. When we refer to hazards in relation to occupational safety and health the most commonly used definition is 'A hazard is a potential source of harm or adverse health effect on a person or persons'. Agriculture is one of the most hazardous sectors in both the developing and industrialized countries. Exposure to pesticides and other agrochemicals constitute major occupational hazards, which may result in poisoning and death and in certain cases, work-related cancer and reproductive impairments (Van and Konradsen, 2005). The job of a farmer is difficult, especially in developing countries such as India, where many agricultural activities are still performed manually. For the present study, a number of health hazards have been listed down and interviewed among the female workers with four point response. The research has been conducted based on two objectives;

- To know the demographic profile of the respondents
- To assess the health hazards experienced by the female workers

Methodology
To conduct the study the North West Development Block of Jorhat district was selected purposively. Four villages namely Upper Deuri, Hokai Khangia, Bormer Chapori and Sonari No. 2 of North West Development Block in Jorhat district of Assam were selected. The study was conducted on 300 female workers who are actively engaged in all the activities of vegetable cultivation starting from land preparation to harvesting of vegetables. Both interview and experimental methods were followed to collect information. The existing research was conducted by using the Nordic questionnaire; the frequencies of health hazard experienced by the workers were assessed in four point scale such as very often (4), often (3), sometimes (2) and never (1), the scores were given as per their response and wt. mean score was calculated and ranked accordingly.

Findings and Discussion

(A) Personal and demographic characteristics of the respondents

This part emphasizes at outlining the personal and demographic characteristics of the respondents. Information was sought on the following aspects and findings are given below with respective table.

1. Age, body height and body weight of the respondents

The findings depicted in Table 1 indicated that majority (60.33%) of the respondents belonged to the age group of 30-40 years. Almost similar per cent of the respondents i.e., 19.67 per cent and 19.33 per cent belonged to the age group 20-30 years and 40-50 years, respectively. Only 0.67 per cent of the respondents were from the age group 50-60 years. A similar finding had been reported by Kumari and Laxmikant (2015) mentioning that in performing agricultural activities in Deoria district of Uttar Pradesh, majority (53.33%) of the respondents belonged to middle age group (26-50 years) followed by young age (below 25 years) and old age (More than 50 years) group. Moreover the findings depicts that most of the respondents (65.67%) body height was in between 150-155 cm followed by 21.00 per cent and 11.00 per cent respondents body height below 150 cm and 155-160 cm, respectively. Most of the respondents (70.00%) had body weight in between 40-50 kg, followed by 27.00 per cent of the respondents having body weight in between 50-60 kg and only 3 per cent of the respondents had body weight below 40 kg. A similar finding was observed by Ojha and Kwatra (2017) mentioning that the average height of female agricultural workers was 151.62±3.60 cm and the average body weight of female agricultural workers of Uttarakhand was 51.11 ± 3.34 kg.

Table 1: Percentage distribution of respondents according to their physical characteristics

(n=300)

Sl. No.	Particulars	Frequency (F)	Percentage (%)
1	**Age of the respondents**		
	20-30 years	59	19.67
	30-40 years	181	60.33
	40-50 years	58	19.33
	50-60 years	2	0.67
2	**Height of respondents**		
	Below 150 cm	63	21.00
	150-155 cm	197	65.67
	155-160 cm	33	11.00
	Above 160 cm	7	2.33
3	**Weight of respondents**		
	Below 40 kg	9	3.00
	40-50 kg	210	70.00
	50-60 kg	81	27.00

Body types of the respondent female workers based on BMI assessment revealed that 70.67 per cent of the respondents belonged to 'Mesomorphic' body type with well developed muscular skeletal system and 29.33 per cent of the respondents with 'Ectomorphic' having slender body type. It had given a clear picture of the health of the respondents that all the women had a good skeletal muscular structure and there was no one with endomorphic body type (Fig. 1). The above findings can be supported by the study of Kalita (2015) [5], who observed that in Jorhat district of Assam 47.00 per cent of the respondents belonged to ectomorphic body type followed by 43.00 per cent and 10.00 per cent of the respondents with mesomorphic and endomorphic body type, respectively.

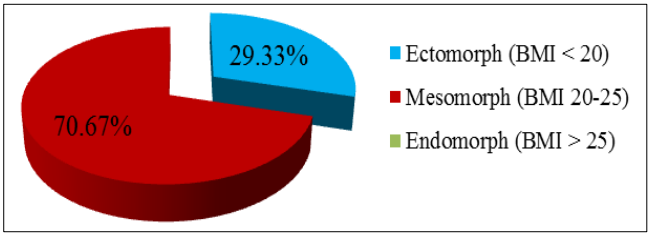

Fig 1: Distribution of respondents according to their body types (n=300)

2. Caste of the respondents

The findings from Table 2 revealed that 43.33 per cent of the respondents belonged to Other Backward Caste (OBC) and 31.00 per cent of the respondents were from Schedule caste and Schedule tribe (SC/ST) category followed by 25.67 per cent of the respondents from General category. It is important to mention that in the selected villages there was a mixed population of different tribal community along with Assamese community such as Deori, Micching and also Miri.

3. Landholdings of the respondents

Data from Table 2 revealed that 34.33 per cent of the respondents belonged to the marginal farmer group followed by 27.67 per cent and 16.67 per cent of the respondents belonging to the small landholding farmers and medium landholding farmers group respectively. The findings further highlighted that 9 per cent of the respondents were landless which means the respondents were wage earners and they worked in other's field for their survival. Only 3.67 per cent respondents had large landholdings. Chinchmalatpure *et al.* (2015) [3] reported that in Akola district of Maharashtra, more than half of the respondents (54.00%) were landless, followed by 36.00 per cent and 10.00 per cent of the respondents had marginal and medium land holding respectively. The reason for this finding might be that most of the rural people of Assam are dependent on agriculture and so they have their own land where they cultivate and produce various agricultural as well as horticultural products.

4. Type of family

It is evident from the Table 2 that majority (54.67%) of the respondents belonged to nuclear family and 45.33 per cent of the respondents belonged to joint family. Kumari and Laxmikant (2015) [6] also observed that majority (64.44%) of respondents participating in agricultural activities in Deoria district of Uttar Pradesh belonged to nuclear family followed by 36.66 per cent to joint family.

5. Occupation of family members

With regard to occupation of family members (Table 2) majority of the respondents (62.00%) were dependent on agriculture. It is evident from the result that 18.33 per cent of the respondent's family occupation is based on non-agricultural work, which indicates that the male members of the family were job holders and the females were involved in cultivation in their own farms. It was observed that the male members helped in performing various tasks related to cultivation before and after their office timing. 12.67 per cent of the respondents' family occupation was business and only 7.00 per cent of the respondents were dependent on dairy,

which indicates that all the respondents had agriculture land along with other occupation (Table 2). Singh (2015) observed that majority (33.30%) of the women farmer's family occupation was farming and service followed by farming and labor (26.70%), and farming and business (25.00%) in Uttarakhand.

Table 2: Distribution of respondents according to their background information

(n = 300)

Sl. No.	Particulars	Frequency (F)	Percentages (%)
1	**Caste**		
	SC/ST	93	31.00
	OBC	130	43.33
	General	77	25.67
2	**Land holdings**		
	Landless	27	9
	Marginal (> 1 ha)	103	34.33
	Small (1-2 ha)	83	27.67
	Medium (2-4 ha)	50	16.67
	Semi medium (4-10 ha)	26	8.67
	Large (>10 ha)	11	3.67
3	**Family type**		
	Nuclear family	164	54.67
	Joint family	136	45.33
4	**Family occupation**		
	Agriculture	186	62.00
	Dairy	21	7.00
	Service	55	18.33
	Business	38	12.67

(B) Work related health hazards faced in vegetable cultivation assessed by Nordic questionnaire

Farming is associated with exposure to a wide range of hazards, all of which can have undesirable consequences, such as infections by pathogens, injuries from exposure, poisonings, physiological disorders, respiratory tract infections, and musculoskeletal disorders. According to the Centers for Disease Control and Prevention (CDC, 2013), agriculture ranks among the top three most hazardous occupational groups in terms of fatalities, injuries, and work-related illnesses. The general pattern of food production is such that farmers are required to work in the open air on a daily basis all year round, often while performing repeated strenuous physical activities in uncomfortable working postures for extended periods of time (Pyykkönen and Aherin, 2012) [9]. For the present study, a number of health hazards have been listed down and interviewed among the female workers with four point response.

1. Health hazards faced by the female workers in land preparation

It is revealed (Table 3) that majority of the respondents 'often' suffered from sunburn and a sizable number of respondents 'sometimes' had shoulder pain, joint pain, pain in hand and irritation or redness in eyes while preparing land. Among all the selected health hazards faced by female workers in land preparation, sunburn was ranked the highest (mean value: 2.87) followed by shoulder pain (1.33) as second and joint pain (1.30) as third. It was observed from further analysis of data that, pain in hand (1.22) was ranked fourth followed by headache (1.16), itching (1.09), skin allergy (1.04), irritation or redness of eyes (1.19), respectively. A study conducted by Badodiya *et al.* (2013) [1] reported that skin irritation and allergies were occurred frequently among majority of the tribal farm women of Madhya Pradesh, during land preparation; moreover cuts, wounds and injuries had been also observed among them.

2. Health hazards faced by the female workers in removing of stalks and stubbles

Table 3 revealed that in removing stalks and stubbles, the workers were seen adopting squatting posture for a long duration with a slight forward bend using a small bamboo stick to pull out the stubbles from soil and sometimes they were observed pulling out the stalks and stubbles by bare hand without using any tool. Land preparation was mostly performed by tractor and subsequently, female workers clean the field manually, adopting various awkward postures which might lead to occurrence of musculoskeletal problems. Majority of the respondents 'often' faced sunburn and 'sometimes' faced health hazards such as irritation or redness in eyes, joint pain, itching, pain in hand and skin allergy. Sunburn (2.89) was ranked first followed by irritation or redness of eyes (2.20) and joint pain (1.34) as second and third respectively. Among all the selected health hazards itching (1.29) was ranked fourth followed by pain in hand (1.26), skin allergy (1.25) and cuts (1.13) (Table 3). Badodiya *et al.* (2013) [1] reported that ache in different body parts is a common problem among the farm women of Madhya Pradesh during cleaning and removing stalks and stubbles.

3. Health hazards faced by the female workers in sowing

It is evident from the results (Table 3) that majority of the respondents 'often' faced sunburn during sowing operation and more than half of the respondents 'sometimes' had joint pain and shoulder pain. Among the problems encountered during sowing operation, joint pain was ranked the highest (mean value: 1.70) followed by pain in hand (1.66) and headache (1.14), sunburn (1.13), itching (1.09) and skin allergy (1.04), respectively. The workers were seen performing the task by adopting forward bending posture with repetition of hand and fingers, which might be the reason behind the occurrence of pain in joints and hand. Similar results had been observed by Murthy and Madhuri (2013) [7] concluding that pain in body parts was observed among farm

women of Andhra Pradesh during sowing operation. It is observed that in sowing operation the respondents experienced less hazards compared to the other operations of vegetable cultivation.

Table 3: Health hazards faced by female workers in land preparation, removing of stalks and stubbles and sowing activity

(n=300)

Health Hazards	Land Preparation							Removing of Stalks and stubbles							Sowing						
	Very often	Often	Sometimes	Never	Total	Mean	Rank	Very often	Often	Sometimes	Never	Total	Mean	Rank	Very often	Often	Sometimes	Never	Total	Mean	Rank
Cuts	-	-	28	272	328	1.09	VI	-	-	40	260	340	1.13	VII	-	-	-	-	-	-	-
Sun burn	-	260	40	—	860	2.87	I	-	268	32	-	868	2.89	I	-	260	40	-	860	1.13	IV
Numbness in finger	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Irritation or redness of eyes	-	-	58	242	358	1.19	VIII	-	62	238	-	662	2.20	II	-	-	-	-	-	-	-
Headache	-	-	48	252	348	1.16	V	-	-	-	-	-	-	-	-	-	42	258	342	1.14	III
Itching	-	-	28	272	328	1.09	VI	-	-	88	212	388	1.29	IV	-	-	28	272	328	1.09	V
Skin allergy	-	-	12	288	312	1.04	VII	-	-	76	224	376	1.25	VI	-	-	12	288	312	1.04	VI
Irritation in eyes due to chemical use	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Irritation in hands due to chemical use	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pain in hand	-	-	67	233	367	1.22	IV	-	-	80	220	380	1.26	V	—	20	158	122	498	1.66	II
Shoulder pain	-	-	98	202	398	1.33	II	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Joint pain	-	-	90	210	390	1.30	III	-	-	102	198	402	1.34	III	-	-	212	88	512	1.70	I

4. Health hazards faced by the female workers in transplanting

Majority of the respondents 'often' endured sunburn and 'sometimes' had joint pain during transplanting of seedling. More than half of the respondents 'sometimes' experienced shoulder pain, pain in hand and itching (Table 4). Sunburn was ranked (mean value: 2.87) first followed by pain in hand (2.08) and shoulder pain (1.93), respectively. It has been observed that the respondents considered transplanting of sapling, as a very tedious and strenuous operation, in which the worker adopts forward bending posture and squatting posture for planting the seedlings by hand. Itching (1.69) was ranked 'fourth' among all the selected health hazards in transplanting operation followed by joint pain (1.25), irritation or redness of eyes (1.19) and skin allergy (1.04), respectively (Table 4). In transplanting of seedling operation Ojha and Kwatra (2012) [8] observed a number of health hazards faced by female workers of Utarakhand, India such as stiffness in joints, cuts and wounds, fore-arm pain, pain in cuff muscle, numbness in finger and pain in trunk.

5. Health hazards faced by the female workers in weeding

Weeding is considered as one of the most important agricultural operations performed inevitably by female workers in almost all the crops throughout the country. The workers were observed adopting squatting posture in the morning and continued it till evening (Hasalkar *et al.*, 2004) [4]. Cent per cent of the respondents 'often' faced sunburn, almost half of the respondents 'often' had skin allergy and majority of the respondents 'sometimes' had joint pain, itching, pain in hand and shoulder (Table 4). Sunburn (3.00) was ranked as the highest among all the selected health hazards followed by cuts (2.70) and skin allergy (2.30) in weeding activity. It is depicted from the findings (Table 4) that among all the health hazards, joint pain was ranked fourth with mean value 2.13; followed by shoulder pain (2.08), pain in hand (2.07), numbness in fingers (1.51) and headache (1.14), respectively. Sunburn was seen as common problem faced by the female workers in almost all the operations, because the workers stay in the field from early morning to evening, in which they are bound to work for daylong as well as the workers were not observed using any protection measures for covering their body parts. According to Badodiya *et al.* (2013) [1] a number of health hazards were faced by majority of the tribal farm women while performing weeding operation such as cuts, wounds, injuries, swollen and sore hands and feet, body ache and insect bite.

Table 4: Health hazards faced by female workers in transplanting, weeding and spreading of manure activity

(n=300)

Health Hazards	Transplanting							Weeding							Spreading of manure						
	Very often	Often	Sometimes	Never	Total	Mean	Rank	Very often	Often	Sometimes	Never	Total	Mean	Rank	Very often	Often	Sometimes	Never	Total	Mean	Rank
Cuts	-	-	-	-	-	-	-	78	91	93	38	809	2.70	II	-	-	-	-	-	-	-
Sun burn	-	260	40	-	860	2.87	I	-	300	-	-	900	3.00	I	-	280	20	-	880	2.93	II
Numbness in finger	-	-	-	-	-	-	-	-	38	78	184	454	1.51	VII	-	98	142	60	638	2.12	V
Irritation or redness of eyes	-	-	58	242	358	1.19	VI	-	-	-	-	-	-	-	-	78	222	-	678	2.26	IV
Headache	-	-	-	-	-	-	-	-	-	42	258	342	1.14	VIII	-	-	42	258	342	1.14	IX
Itching	-	20	166	114	506	1.69	IV	—	68	186	46	622	2.07	VI	-	28	272	-	628	1.18	VIII
Skin allergy	-	-	12	288	312	1.04	VII	—	152	88	60	692	2.30	III	-	-	12	288	312	1.04	X
Irritation in eyes due to chemical use	-	-	-	-	-	-	-	-	-	-	-	-	-		88	138	74	-	914	3.04	I
Irritation in hands due to chemical use	-	-	-	-	-	-	-	-	-	-	-	-	-		126	82	92	-	842	2.80	III
Pain in hand	-	74	178	48	626	2.08	II	-	68	185	47	621	2.07	VI	-	-	72	228	372	1.24	VII
Shoulder pain	-	49	183	68	581	1.93	III	-	78	170	52	626	2.08	V	-	-	102	198	402	1.34	VI
Joint pain	-	38	262	-	376	1.25	V	-	74	192	34	606	2.13	IV	-	-	-	-	-	-	-

6. Health hazards faced by the female workers in spreading of manure

This operation was performed by the female workers in forward bending posture, where they need to bend repetitively to apply the fertilizer in the root of the vegetable plant. It is important to note that the respondents were observed applying fertilizer with bare hand and there is a huge possibility of occurrence of various biological problems affecting health condition of the female workers as the chemical substances are very harmful. It was observed that majority of the respondents 'often' suffered from sunburn and 'sometimes' had itching, irritation or redness of eyes. A sizable number of respondents 'very often' had irritation in hands (42.00%) and eyes (29.33) due to chemical use. It is depicted from the results (Table 4) 'irritation in eyes' was ranked highest due to chemical use (mean value 3.04) followed by sunburn (2.93), irritation in hands due to chemical use (2.80), irritation or redness of eyes (2.26), numbness in finger (2.12), shoulder pain (1.34), pain in hand (1.24), itching (1.18), headache (1.14) and skin allergy (1.04), respectively. The above findings can be supported by the study of Vastrad *et al.* (2014) which reported that the farm workers faced various health problems during fertilizer application in maize, wheat and sorghum field such as; skin allergy, sweating, soiling of feet and headache.

7. Health hazards faced by the female workers in harvesting

Data presented in Table 5 revealed that majority of the respondents 'very often' experienced cuts, pain in hand, shoulder pain during harvesting of vegetables and 'often' had sunburn, skin allergy, joint pain, numbness in fingers. It was observed that majority if the respondents 'sometimes' suffered from health hazards such as itching, headache and irritation or redness of eyes. Among all the selected health hazards, 'cuts' was ranked (mean value: 3.93) first followed by joint pain (3.42) and shoulder pain (3.38) as second and third respectively. It was also observed from further analysis of data that pain in hand (3.35) was ranked as fourth followed by sunburn (3.16), numbness in fingers (3.13), skin allergy (3.12), irritation or redness of eyes (2.29), headache (2.19) and itching (2.14), respectively. The results are in conformity with the study conducted by Badodiya *et al.* (2013) [1] which proclaimed that majority of the farm women experienced cuts, wounds and injuries as the major problem in harvesting operation and approximately half of the farm women reported of swelling and soreness in both upper and lower limbs followed by very frequent body ache among the tribal farm women involved in harvesting operation.

Table 5: Health hazards faced by female workers in harvesting activity

(n=300)

Health Hazards	Harvesting						
	Very Often (f)	Often (f)	Sometimes (f)	Never (f)	Total	Mean	Rank
Cuts	278	22	-	-	1178	3.93	I
Sun burn	48	252	-	-	948	3.16	V
Numbness in finger	88	162	50	-	938	3.13	VI
Irritation or redness of eyes	-	88	212	-	688	2.29	VIII
Headache	-	58	242	-	658	2.19	IX
Itching	-	42	258	-	642	2.14	X
Skin allergy	80	178	42	-	938	3.12	VII
Irritation in eyes due to chemical use	-	-	-	-	-	-	-
Irritation in hands due to chemical use	-	-	-	-	-	-	-
Pain in hand	158	88	54	-	1004	3.35	IV
Shoulder pain	158	98	44	-	1014	3.38	III
Joint pain	126	174	-	-	1026	3.42	II

The above discussion has presented a detail information about the health hazards assessment by using modified Nordic Questionnaire mentioning that in most of the activities the respondents faced sunburn, shoulder pain, joint pain, headache, skin allergy, cuts, irritation due to chemical use. Pain in joints requires concern as most of the activities were repetitive in nature. In harvesting and weeding cuts were found to occur among the respondents and were highest in harvesting which can be controlled by using ergonomic approach.

Conclusion

Farming is also associated with exposure to a wide range of hazards, all of which can have undesirable consequences, such as infections by pathogens, injuries from exposure, poisonings, physiological disorders, respiratory tract infections, and musculoskeletal disorders. According to the Centers for Disease Control and Prevention (CDC, 2013), agriculture ranks among the top three most hazardous occupational groups in terms of fatalities, injuries, and work related illnesses. The above discussion enlightens that the respondents are experiencing tremendous difficulties during their work in field, and which are still neglected and ignored. The existing scenario can be improved to some extent by applying appropriate ergonomic approaches for the users for their well being and sustainability concerning their comfort ability and improving efficiency.

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