The Pharma Innovation Journal 2023; SP-12(7): 1506-1511

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(7): 1506-1511

www.thepharmajournal.com
Received: 17-04-2023
Accepted: 20-05-2023

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Health of dairy farm workers in Punjab (India)

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Abstract
Background: Labourers play a crucial role in performing various daily chores on dairy farms but they remain out of focus in majorities of schemes and outreach programmes. Owing to scant research, the present study evaluated the self-declared health problems in dairy farm workers of Punjab. Dairy is one of the most hazardous industries and dairy labourers are one of the most ignored and deprived sections of this sector.
Methods: A total of 780 dairy farm labourers (Periurban -300; rural small scale-240; Rural commercial -240) were interviewed using a pretested structured interview schedule (Cronbach's alpha 0.75). Statistical analysis including descriptive statistics, Chi-square test of independence, and F-test were used to draw the inference.
Results: The majority of respondents had abnormal blood pressure (60.87%), body fatigue (72.04%), and various types of body pains (84.60%), but only 13.06% were found to have unhealthy body mass index (BMI). Further, blood pressure, BMI, and other health-related ailments *viz*. body aches, disc problems, allergies, injuries, GIT problems, etc varied significantly ($p<0.05$) among the three categories of workers studied. Overall, the majority of dairy labourers (56%) had medium health status and later differ significantly ($\chi^2= 22.81$, $p<0.01$) between the three categories of labourers studied. Dairy farm labours required better knowledge of dairying, work-related health problems, safety along with the provision of health insurance, and easy access to health facilities.

Keywords: Dairy labourers, hypertension, health status, occupational hazards, workers

Introduction
Dairy farming though an age-old occupation, still presents a unique set of occupational hazards. These hazards in dairying have gradually increased in scope and severity over the years due to intensification, commercialization, and mechanization leading to various health-related ailments. Dairy labourers are part or full-time hired workers on predecided wages by the dairy farmers to perform the dairy farm-related chores on a regular or daily basis. Working with large-sized animals and risk of being kicked/crushed, slippery floor (Arcury and Quandt, 2007) [3], Musco-skeletal disorders due to physically demanding work and difficult posture during repetitive chores like feeding, milking (Kolstrup *et al.* 2006) [6], asthma, and chronic bronchitis due to dust (May and Arcury, 2020) [7] allergens, etc. predisposed farmworkers for health-related problems. Further, the mental stress of work, technologies (Price, 2015) [10] low socioeconomic status, separation from family or relative in case of migrants workers (Sohrabi, 2015) [15], etc. aggravate the condition. Keeping the above facts in mind, this study was conducted to evaluate the health status of dairy labourers in the Punjab state.

Materials and Methods
Ethical permission
The Institutional Ethical Committee of Dayanand Medical College and Hospital, Ludhiana, approved this study (DMCH/R&D/2020/164). The study's objective was explicitly explained to respondents in their dialect to ensure their voluntary participation.

Locale and duration of the study
Punjab (30°4′N,75°5′E), is one of the leading dairy states with the highest per capita milk availability (1181 gm/person/day) in the country (BAHS, 2019) [4]. Presently, the state is home to 2.47 million cattle and 4.01 million buffalo, respectively. In rural areas, over 70% of households own livestock (Ali, 2007) [1] which aid in their livelihood, nutritional as well as in economic security. The state is divided into three regions namely Majha, Malwa, and Doaba regions by two rivers. This present study was conducted in all three regions on dairy labourers

working on rural small scale (< 10 animals), rural commercial (>10 animals), and peri-urban dairy farms (>10 dairy animals and located within a five-kilometer radius of urban areas). Data for this study were collected between November 2020 and October 2021.

Sample size determination: With 50% of the population having the factor of interest and a 50% expected response rate, the study required sample size of 769 to estimate the expected proportion with a precision of 5% and a confidence level of 95% (Dhand and Khatkar, 2014) [5].

Designing interview schedule and pre-testing: Based on literature and discussion with subject matter specialists of the university, a comprehensive interview schedule was prepared and pretested on 50 dairy labourers selected from the Ludhiana and Amritsar districts. Accordingly, changes were made to the final schedule to make it more appropriate and cohesive. Cronbach's alpha value of 0.75 indicates good internal consistency of the final interview schedule related to the topic covered. The final schedule comprised of independents variables naming socio-demographic characteristics of respondents (Gender, age education, family type, family size, state of domicile, Monthy wages, monthly family income, number of rooms) and dairy farm characteristics (herd size, experience at present farm, total experience in dairy farm, and daily working hours at the farm), and dependents variables like Blood pressure, Body mass index and health status. Data on self-reported health status were collected on never, some time, and frequently encountered responses. A score of 1 was given
to never encountered response and 0 was used for some time and frequent responses. Based on the mean score of the dependent variable, responses were categorized as poor (Less than Mean -Standard Deviation (SD), medium (Mean-SD to Mean +SD), and good (Above Mean +SD).

Selection of participants, data collection, and analysis: The target population was rural and periurban dairy farm labourers in Punjab. The Multistage random technique was used to select districts (Two/ region), blocks (Two /district), villages (Two /block) for rural dairy labourers. A total of 480 rural dairy labourers comprising 240 working in rural small scales farms and 240 rural commercial farms were selected from 24 villages. Further, 300 periurban dairy farm labourers were surveyed from the purposively selected farms located around the biggest city of each region, making a total samples size of 780. Selection criteria of respondents include one labourer/farm with age at least 18 years old, employed full-time on a dairy farm, and had at least three months of experience working on the present farm. After taking verbal consent, personally, interviews were conducted in vernacular language to collect the data. The blood pressure of respondents was measured using an electronic blood pressure monitor (Sino-heart) in a rested (30 minutes) and calm environment. The right arm was measured twice with brief intervals between measurements, and data were averaged and analyzed. The reading of 120/80 mmHg blood was considered normal. Between 120-129 mmHg systolic and 80 mmHg diastolic, readings were considered high. The hypertension group was divided into two stages: Stage 1, defined as having a systolic blood pressure of 130-139 or diastolic blood pressure of 80-89 mmHg; and Stage 2, defined as having a systolic blood pressure of at least 140 or diastolic blood pressure of at least 90 mmHg. Hypotension is defined as blood pressure (systolic/diastolic) reading of less than 90/60 mmHg (Son *et al*., 2018) [15].

Body mass index (BMI) was calculated using the standard formula (weight [kilograms]/height [meters squared]) in accordance with WHO guidelines and was classified into four standard groups: underweight (less than 18.5 Kg/m^2), normal range (18.5 Kg/m^2–24.9 Kg/m^2), overweight (25 Kg/m^2–29.9 Kg/m^2), and obese (more than 30 Kg/m^2) (Obese, 1998) [8]. All data were entered into Microsoft Excel and descriptive analysis was conducted using SPSS 20.0. The Chi-square and Analysis of Variance (F-test) were used to draw the inference.

Results and Discussion

Socio-economic profile of respondents: The majority of respondents were men (89.61%), illiterate (52.94%), had nuclear (88.33%) and small (54.48%) families and were migrant workers from other states (58.98%). Respondents were found consuming tobacco (37.17%), alcohol (25.38%), cigarettes (3.97%), and medicinal drugs (2.69%) (Table 1). The average monthly wages of respondents were rupees 9387.56 and monthly household income was 12813 rupees (Table 2). At the present dairy farm, the average length of employment was 5.14 years. The average dairy labourer had 12.85 years of total dairy farm work experience. The number of animals on farms surveyed varied from four to three hundred animals. On average, farms surveyed had 2.41 labourers /farm, further, each labourer worked 9.51 hours per day (Table 3).

Health status of respondents: Overall, 60% of respondents were found to have abnormal blood pressure and out of which majority had elevated and only six respondents were found having hypotension. Elevated blood pressure may predispose the person to cardiac and renal diseases. Blood pressure varied significantly (<0.01) among different categories' studied (Table 4). Hypertension stage II (6%) and hypotension (2%) were found only in peri-urban dairy labourers further, a higher fraction of peri-urban dairy labourers have higher Hypertension stage I (Table 4). Only three persons with hypertension were reported to take the tablet on regular basis, the rest were even not aware of their hypertension status. Over-demanding jobs, long work hours, psychological hazards, and stress may all contribute to elevated blood pressure and other health-related issues. However, other factors such as age, lifestyle, genetics, food habits, work environment, and lack of health facilities may all play a role. Persistent noise at the farm influences the concentration and enhanced the chance of mistakes (Anonymous 2001) [2], the latter brings the labourers under stress to perform accurately. Migrant nature, away from family members, language problems, etc. further aggravated the stress condition. Stress causes many ailments including high blood pressure (Šístková & Peterka, 2009) [13] in the body, which further lead to atherosclerosis, aneurysm renal disease, and stroke. The relationship between dairy and dairy

products consumption with hypertension is still debatable. The present study found that around 25% of peri-urban dairy labourers were having abnormal body mass index as compared to only 7% in rural dairy labourers. (Table 4). Previously, TePoel *et al*. (2017) [16] reported that more than 75% of all farmworkers had an unhealthy BMI. Dairy farm demands physical and musculoskeletal activities which help in maintaining the ideal body mass index.

Table 5 summarises the self-reported health status of dairy labourers. Body fatigue (68.46%), swollen hand (60.12%), headache, shoulder pain, and elbow pain (56.66%), rashes or skin problems (19.23%), eye problems/irritation/injury (17.43%), nausea/sneezing (16.53%), gastrointestinal problems (16.41%) were certain health issues occurred sometime reported by dairy labourers in this study. However, 28% of labourers reported encountering shoulder and elbow pain frequently. Surprisingly, these ailments did not lead to the loss of any working days as the majority of labourers continue to do their routine work and sought medical intervention only when the disease becomes severe. Six respondents even revealed that they have poor eyesight but due to financial constraints they are unable to go for checkups. One worker showed his accidentally chopped fingers that occurred during the chopping of green fodder. Joint pain, slip disc-back pain, rashes/skin problems, eye problems, GIT problems, coughing, nausea/sneezing, swollen hand, and body fatigue varied significantly ($P < 0.05$) among three types of dairy labourers studied. Overall, the majority of dairy labourers (56%) had medium and one-fifth had poor health status (Table 6). Further, health status differs significantly ($\chi^2 = 22.81$, $p < 0.01$) between three categories of respondents.

Previously, it has been shown that problems like respiratory infections, digestive problems, dermatological problems, indiscrete diseases like fever, body pain, headache, joint pain, itchy eyes, coughing, difficulty breathing occurred in dairy farmers and workers (Rajkumar *et al*. 2016; Panikkar and Barrett, 2021) [11, 9]. To overcome the body fatigue, musculoskeletal pain, respondents reported to do massage of limbs/feet with mustard oil and balms (n=21) during the night, further in the event of severe pain, respondents (n=32) reported taking the painkiller as given by the person on local medicine shop. Also, consumption of tobacco, alcohol or medicinal drugs found in this study could be done to overcome the pain or body fatigue. Milking of dairy animals is one of the regular and routine work and time spent on milking varies depending upon the number of animals to be milked. Though most respondents abstained to disclose, 17 respondents reported suffering from piles. Regular squatting posture used for manual milking may be the reason but further diagnostic-based study is required to explore this.

Dairying is a labour-intensive occupation that demands 24X7 vigil and regular activities. Hired dairy labourers become a vital part of dairy farms, especially having more than 10 animals. But parallelly it is also true that they are the most ignored and ill-focused personnel in the dairy sector. The present study revealed that the majority of labourers were having abnormal blood pressure and health-related issues. We recommend the capacity building of dairy labourers with a focus on hazardous prevention to curb dairy farm-related health issues. The dairy owner should also be sensitized to bear some responsibilities and must send their worker(s) to get training on various aspects of dairying at his expense. The training of farmworkers will show its impact in long term by optimizing production and reduced disease incidence. Proper health evaluation through invasive techniques and seroprevalence of different zoonotic diseases should be checked in these deprived, uneducated sections of society. We advocate that first on-farm diseases screening of labourers should be done, where needed further diagnosis aid and treatment should be ensured at the nearby health centre. Further, we recommend the development of a dairy labourer-assured health scheme at the National level with the provision of regular check-ups of labourers and free or economical treatment options at the nearby health center.

The study has many limitations like the use of convenient sampling in periurban dairy farms, self-reported data, respondents may not have disclosed everything, and our inability to quantify the health status of dairy labourers. Proper diagnostic aid with a medical professional opinion will provide a sure cue. The study did not cover diet consumption patterns, the incidence of infectious diseases in animals, temporal behaviour to correlate them with the health status of dairy labourers. However, we consider that our results are representative of the problem in the country.

Further, the study has many implications including the need for job safety training for labourers before starting the job at the farm, awareness of biological hazards and infectious diseases, correcting misperceptions regarding the treatments of ailments that occurred while working at the farm. Further, these capacity-building programs should be tailored as per diversity across the labourers in language, education, and culture (Arcury *et al*, 1998) [17]. Different teaching aids like picture charts, films, on-farm demonstrations, etc. in their vernacular language can be used for imparting training. Further pictorial charts can be provided to hang on, at the appropriate place in a farm for a quick reference.

Conclusion

The current study adds to our understanding of certain aspects of the current health status of labourers employed on dairy farms in Punjab. While many respondents commented on their good health, some reported experiencing body fatigue, shoulder, and body pain as a result of their work on a dairy farm. This study brings to light issues affecting the underprivileged population of dairy farm workers and may pave the way for a more focused investigation of the specific health issues associated with dairy farm work. Future research should investigate the prevalence of infectious and zoonotic disease in dairy labourers and their family members, farm air quality index versus respiration ailments in labourers, quantitative evaluation of dental and musculoskeletal ailments associated with dairy farm work.

Conflicts of Interest: The authors declare no conflict of interest.

Table 1: Demographic characteristic of dairy farm labourers

Variable	Category	Dairy farm labourers (N =780)			Overall (N=780)	Chi-square	P-value
		Peri-urban (N=300)	Rural commercial (N=240)	Rural small (N=240)			
		N (%)	N (%)	N (%)	N (%)		
Gender	Female	17 (5.67)	10 (4.16)	54 (22.50)	81 (10.38)	55.00	<0.01
	Male	283 (94.33)	230 (95.83)	186 (77.50)	699 (89.61)		
Educational status	Illiterate	176 (58.67)	117 (48.75)	120 (50.00)	413 (52.94)	21.83	<0.05
	Below primary	44 (14.67)	57 (23.75)	60 (25.00)	161 (20.64)		
	Primary	37 (12.33)	41 (17.08)	38 (15.83)	116 (14.87)		
	Middle	31 (10.33)	14 (5.83)	16 (6.66)	61 (7.82)		
	High school	8 (2.67)	5 (2.08)	5 (2.083)	18 (2.30)		
	Higher secondary	4 (1.33)	6 (2.5)	1 (0.41)	11 (1.41)		
Family type	Nuclear	257 (85.67)	211 (87.91)	221 (92.08)	689 (88.33)	5.38	>0.05
	Joint	43 (14.33)	29 (12.08)	19 (7.91)	91 (11.66)		
Family size	Small (up to 4 members)	154 (51.33)	135 (56.25)	136 (56.66)	425 (54.48)	3.33	>0.05
	Medium (5-8 members)	144 (48.00)	104 (43.33)	104 (43.33)	352 (45.12)		
	Large (>8 members)	2 (0.67)	1 (0.41)	-	3 (0.38)		
State of domicile	Bihar	116 (38.67)	50 (20.83)	49 (20.41)	215 (27.56)	59.34	<0.01
	Punjab	76 (25.33)	129 (53.75)	115 (47.91)	320 (41.02)		
	Uttar Pradesh	95 (31.67)	58 (24.16)	70 (29.16)	223 (28.58)		
		13 (4.33)	3 (1.25)	6 (2.50)	22 (2.82)		
Addiction of substances	Tobacco	155 (51.66)	68 (28.33)	67 (27.91)	290 (37.17)	73.036	<0.01
	Cigarette	11 (3.66)	6 (2.50)	14 (5.83)	31 (3.97)		
	Alcohol	64 (21.33)	85 (35.41)	49 (20.41)	198 (25.38)		
	Medicinal drug	1 (0.33)	12 (5.00)	8 (3.33)	21 (2.69)		
	None	69 (23.00)	69 (28.75)	102 (42.50)	240 (30.76)		

Table 2: Socio-economic characteristics of dairy farm labourers

Variable	Dairy farm labourers (N =780)						Overall (N=780)		F value	P-value
	Peri-urban (N=300)		Rural commercial(N=240)		Rural small (N=240)					
	Observed range	Mean± SD	Observed range	Mean ±SD	Observed range	Mean± SD	Observed range	Mean± SD		
Age (years)	19-80	35.74±11.88	18-70	35.91±11.60	19-68	34.89±10.52	18-80	35.53±11.39	0.59	>0.05
Number of rooms in the house where the labourer is living	1-4.00	1.20±0.46	1-4	1.48±0.65	1-3	1.46±0.62	1-4	1.37±0.59	20.44	<0.01
Monthly wages for working at the farm (Rupees)	4000-16000	10871.67±2697.29	3500-20000	8965.83±2070.49	4000-12000	7954.16±1577.29	3500-20000	9387.56±2531.21	121.55	<0.01
Monthly family income from all sources (Rupees)	5000-34000	14687.67±5661.95	5000-30000	11481.25±4496.06	6000-28000	11802.92±4403.61	5000-34000	12813.46±5164.31	35.57	<0.01

Table 3: Farm experience of dairy farm labourers

Variable	Dairy farm labourers (N =780)						Overall (N=780)		F value	P-value
	Peri-urban (N=300)		Rural commercial (N=240)		Rural small (N=240)					
	Observed range	Mean± SD	Observed range	Mean ±SD	Observed range	Mean ±SD	Observed range	Mean ±SD		
From how many years you are working at the present dairy farm	0.5-40	5.79±5.71	0.5-30	5.18±4.67	0.5-25	4.27±3.48	0.5-40	5.14±4.84	6.56	<0.01
Total experience of working in dairy farms (years)	0.5-45	14.09±9.23	0.5-40	12.90±8.52	1-40	11.22±7.51	0.5-45	12.85±8.59	7.48	<0.01
Number of animals at the farm	12-300	68.36±43.43	11-110	24.94±13.81	4-10	8.58±1.50	4-300	36.62±38.14	332.51	<0.01
Number of labour (s) at the farm	1-13	3.98±2.04	1-5	1.85±0.75	1-3	1.00±0.12	1-13	2.41±1.85	359.39	<0.01
Total daily working hours at the farm	5-13	10.35±1.17	6-12	9.64±1.09	4-10	8.30±1.48	4-13	9.51±1.52	177.13	<0.01

Table 4: Distribution of dairy farm labourers according to blood pressure and body mass index

Variable	Category	Dairy farm labourers (N =780)			Overall (N=780)	Chi-square	P-value
		Peri-urban (N=300)	Rural commercial (N=240)	Rural small (N=240)			
		N (%)	N (%)	N (%)	N (%)		
Blood pressure	Normal	120 (40.00)	91 (37.91)	94 (39.16)	305 (39.10)	46.106	<0.01
	Elevated	98 (32.66)	108 (45.00)	107 (44.58)	313 (40.12)		
	Hypertension (Stage I)	58 (19.33)	41 (17.08)	39 (16.25)	138 (17.69)		
	Hypertension (Stage II)	18 (6.00)	-	-	18 (2.30)		
	Hypotension (Low)	6 (2.00)	-	-	6 (0.76)		
Body mass index	Underweight	20 (6.66)	7 (2.91)	5 (2.08)	32 (4.10)	72.841	<0.01
	Ideal	223 (74.33)	224 (93.33)	231 (96.25)	678 (86.92)		
	Overweight	55 (18.33)	8 (3.33)	4 (1.66)	67 (8.58)		
	Obesity	2 (0.66)	1 (0.41)	-	3 (0.38)		

Table 5: Self-reported health status of dairy farm labourers

Variable	Dairy farm labourers (N =780)									Overall (N=780)			Chi-square	P-value
	Peri-urban (N=300)			Rural commercial (N=240)			Rural small (N=240)							
	NE N (%)	S N (%)	FN (%)	NEN (%)	SN (%)	FN (%)	NEN (%)	SN (%)	FN (%)	NEN (%)	SN (%)	FN (%)		
Headache, shoulder pain, elbow pain	82 (27.33)	177 (59.00)	41 (13.66)	19 (7.91)	129 (53.75)	92 (38.33)	19 (7.91)	136 (56.66)	85 (35.41)	120 (15.38)	442 (56.66)	218 (27.94)	81.834	<0.01
Neck pain	255 (85.00)	36 (12.00)	9 (3.00)	188 (78.33)	42 (17.50)	10 (4.16)	199 (82.91)	30 (12.50)	11 (4.58)	642 (82.30)	108 (13.84)	30 (3.84)	5.064	>0.05
Slip disc-back pain	227 (75.66)	32 (10.66)	41 (13.66)	168 (70.00)	53 (22.08)	19 (7.91)	183 (76.25)	43 (17.91)	14 (5.83)	578 (74.10)	128 (16.41)	74 (9.48)	21.388	<0.01
Dental problems	261 (87.00)	34 (11.33)	5 (1.66)	213 (88.75)	24 (10.00)	3 (1.25)	214 (89.16)	20 (8.33)	6 (2.50)	688 (88.20)	78 (10.00)	14 (1.79)	2.372	>0.05
Allergies	268 (89.33)	28 (9.33)	4 (1.33)	228 (95.00)	9 (3.75)	3 (1.25)	226 (94.16)	12 (5.00)	2 (0.83)	722 (92.56)	49 (6.28)	9 (1.15)	8.399	>0.05
Rashes or skin problems	212 (70.66)	82 (27.33)	6 (2.00)	206 (85.83)	33 (13.75)	1 (0.41)	203 (84.58)	35 (14.58)	2 (0.83)	621 (79.61)	150 (19.23)	9 (1.15)	24.819	<0.01
Eye problems /irritation/injury	217 (72.33)	78 (26.00)	5 (1.66)	209 (87.08)	29 (12.08)	2 (0.83)	207 (86.25)	29 (12.08)	4 (1.66)	633 (81.15)	136 (17.43)	11 (1.41)	26.009	<0.01
Gastrointestinal problems	227 (75.66)	67 (22.33)	6 (2.00)	209 (87.08)	26 (10.83)	5 (2.08)	198 (82.50)	35 (14.58)	7 (2.91)	634 (81.28)	128 (16.41)	18 (2.30)	14.217	<0.01
Coughing	232 (77.33)	59 (19.66)	9 (3.00)	215 (89.58)	20 (8.33)	5 (2.08)	209 (87.08)	27 (11.25)	4 (1.66)	656 (84.10)	106 (13.58)	18 (2.30)	17.847	<0.01
Nausea / Sneezing	221 (73.66)	75 (25.00)	4 (1.33)	207 (86.25)	26 (10.83)	7 (2.91)	208 (86.66)	28 (11.66)	4 (1.66)	636 (81.53)	129 (16.53)	15 (1.92)	26.719	<0.01
Respiratory problems (asthma, bronchitis)	297 (99.00)	3 (1.00)	-	237 (98.75)	2 (0.83)	1 (0.41)	237 (98.75)	3 (1.25)	-	771 (98.84)	8 (1.02)	1 (0.12)	2.457	>0.05
Swollen hand	128 (42.66)	171 (57.00)	1 (0.33)	75 (31.25)	163 (67.91)	2 (0.83)	104 (43.33)	135 (56.25)	1 (0.41)	307 (39.35)	469 (60.12)	4 (0.51)	10.029	<0.05
Body fatigue	79 (26.33)	199 (66.33)	22 (7.33)	66 (27.50)	170 (70.83)	4 (1.66)	73 (30.41)	165 (68.75)	2 (0.83)	218 (27.94)	534 (68.46)	28 (3.58)	20.483	<0.01

Never-NE, Sometime-S, Frequent-F

Table 6: Score-based classification of the health status of dairy labourers

Variable	Category				χ^2	P-value
	Peri-urban (n=300) N (%)	Rural commercial (n=240) N (%)	Rural small scale (n=240) N (%)	Overall (n=780) N (%)		
Poor	83 (27.66)	36 (15.00)	39 (16.25)	158 (20.26)	22.81	<0.01
Medium	146 (48.66)	154 (64.16)	137 (57.08)	437 (56.03)		
Good	71 (23.66)	50 (20.83)	64 (26.66)	185 (23.72)		

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