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ON OCCUPATIONAL HEALTH AND SAFETY

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Textile sector

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Textile matters: Improving safety is not enough

While recent tragic events in Pakistan, Bangladesh and other countries brought the spotlight on the ready-made garment (RMG) industry and triggered G7 and G20 support for better safety and working conditions in the sector, health issues are in danger of being overlooked. It is true that efforts at improving structural and fire safety are absolutely necessary. They require relentless and coordinated action between governments, employers, workers, and buyers as key stakeholders.

However, safety cannot be the exclusive focus. Attention must also be paid to the prevention of risks to worker's health, such as musculoskeletal disorders, exposure to chemicals as well as dusts and fibres, and psychosocial issues to mention just a few. There are marked differences in the exposure of women to risk compared to men, not least concerning reproductive health and health and safety policies have to be considered with gender in mind.

The RMG and related industry sector is characterized by a number of distinctive attributes: geographically dispersed production, rapidly evolving technology and materials and swift changes in markets driven by customer demand and industrial innovation. Typically, it is labour intensive and women make up the majority of workers. It operates in a challenging environment. Strong global competition means there are substantial incentives to maximize short-term profit which, if not coupled by appropriate labour protection policies, can entail the risk of relegating workers' well-being, health and safety to a lower priority. This is especially the case when the sector generates a major element of export earnings for a country.

It is well understood that the sector creates jobs in countries with vulnerable economies, especially for women, youth and low-skilled workers. Employment creation potential continues to grow in many countries and across many categories of workers, including migrant workers that may be willing to accept substandard conditions. But these contributions can no longer be used to justify the lack of investment in labour protection.

It is worth remembering that labour is not a commodity. Workers bring distinctive skills and contribute to business growth. In this sector workmanship is a competitive factor. Protecting the health and safety of workers and ensuring their well-being through decent wages and working hours is a primary condition for economic sustainability and industrial peace. It is a necessary condition for sustainable profitability of businesses in the real economy.

Tackling the health component of occupational health and safety (OSH) calls for a multi-faceted approach. Apart from strengthening control functions there must be strategic investment in enhancing risk knowledge and building capacities of key stakeholders. Those stakeholders are broadly based; they include, but are not limited to: government and public agencies, employers' and workers' organizations, universities, research institutes, education and training institutions, professional associations, and OSH advisory service providers. Together they have a key role in developing and sharing knowledge and information, enhancing public awareness and fostering a culture of safety and health at the country and sector levels. Strengthening capacities should contribute to shaping and implementing better informed OSH policies and programmes, and improve compliance with applicable standards.

The International Labour Organization has been and remains deeply involved in promoting Decent Work in this sector. It has devised innovative technical assistance programmes such as Better Work, and is positioning the issues ahead of the forthcoming global policy dialogue on labour-related matters in global supply chains to be discussed at the International Labour Conference in June 2016. Stakeholders from around the world are now uniting and committing to improved safety and health at work in the textile and related industries.

This special issue of the Asian-Pacific Newsletter is a global knowledge sharing tool to support action worldwide. Let us continue making the world of work healthier and safer, it works!

Gilbert Houngbo
Deputy Director General for
Field Operations and Partnerships
International Labour Organization,
Geneva

Photos by ILO

RMG workers practise an evacuation.

Steve Needham, ILO

Building a culture of OSH in Bangladesh

It hardly takes research to reveal the lack of an Occupational Safety and Health culture in Bangladesh. Any short stroll through the streets of Dhaka will expose workplace practices so staggeringly dangerous that disaster seems only moments away. Workers cutting steel in a shower of sparks with no safety goggles and bare feet, construction workers riding pile drivers rodeo style, air conditioning repairmen clinging to the side of 20-storey buildings like spiderman…

Though there is no official data on how many workers suffer occupational accidents in Bangladesh each year, according to the Bangladesh Institute of Labour Studies' (BILS) newspaper-based survey, a total of 5909 workers died and 14 413 workers were injured in different occupational accidents over a ten-year period (2002–2012).

In the rush for development and to create jobs, safety concerns seemed a low priority. However, things are starting to change. Two major incidents, the Tazreen Fashions fire in 2012 and the Rana Plaza Collapse in 2013 led to worldwide scrutiny of workplace safety in Bangladesh. Recognition that safety needed to be urgently addressed became very real. Special focus was placed on the huge ready-made garment (RMG) industry, which employs some 4.2 million and generates some 80% of the nation's export earnings.

In the aftermath of Rana Plaza, the International Labour Organization (ILO) collaborated closely with the Government of Bangladesh, unions and employers' organizations, civil society, and international brands and retailers to agree on a set of necessary steps to enhance safety in the RMG sector.

The ILO subsequently launched a major programme in September 2013, funded by Canada, the Netherlands and the United Kingdom, to improve working conditions in the RMG sector. This initiative, which runs to December 2016, includes major safety-related components aimed at enhancing building integrity, boosting the capacity of the labour inspectorate and building OSH awareness, capacity and systems.

The challenges are considerable.

"There is a lack of a safety and health culture in Bangladesh," says Tuomo Poutiainen, Programme manager of ILO's Improving Working Conditions in the RMG sector initiative.

"The main issue in Bangladesh is that there is relatively little technical capacity and understanding among employers and workers, and even to a certain extent the government, on how to manage safety and health at the enterprise level."

The ILO's OSH-related actions take place at a variety of levels and have a wide range of partners.

"The programme sets out to create a joint understanding and joint capacity in a practical sense around the workplace so that there is a real impact on the lives of workers and that they are better equipped to deal with OSH issues," Poutiainen adds.

A major component of the work has seen all export-oriented RMG factories undergo inspection for structural, fire and electrical safety. Between mid-2013 and October 2015, over 3500 RMG factories were assessed by the government, with support from the ILO as well as the Bangladesh Accord for Fire and Building Safety and the Alliance for Bangladesh Worker Safety. Of these, 37 were closed due to the serious nature of the safety risks they posed. A further 36 were partially closed, while all others need to undergo a series of remediation actions to address issues identified during the inspections.

"Carrying out these inspections is a significant milestone, yet it is only the beginning," said Mr Srinivas Reddy, ILO Bangladesh Country Director.

"RMG factories that were found to pose imminent danger have been closed. All other factories will now need to develop and implement Corrective Action Plans to remedy the shortcomings identified by the inspection process. The safety of the Bangladesh RMG sector depends on this process being completed without delay."

In addition to factory inspections, the programme has worked with the Government of Bangladesh to produce the country's first ever OSH Policy, as well as an OSH Profile.

These documents provide vital guidance to all national OSH efforts, as Tuomo Poutiainen explains.

"There needs to be a common vision that unites every stakeholder with regards to OSH. A good policy and action plan allows you to prioritize and to use resources more strategically to address issues. There is so much for us to do in the OSH field in Bangladesh. It is vital that we prioritize the areas with the biggest potential gains."

The OSH Policy was reported on 5 November 2013, and clearly defines roles and responsibilities relating to OSH, as well as a work plan of actions to be taken in this regard. Meanwhile, the OSH Profile is in the final stages of development and presents a complete picture of OSH in Bangladesh, the first since 2002.

While the OSH Policy and Profile are foundations upon which better safety can be built in Bangladesh, the ILO is also working to empower various stakeholders so they can help mitigate risks on a systematic basis.

In order to help create greater knowledge in the workplace, the ILO is collaborating with the Bangladesh Employers Federation (BEF) in an ambitious initiative to spread OSH awareness among some 800 000 workers.

Utilizing the Essential OSH (E-OSH) materials developed by the ILO's International Training Centre in Turin, a core group of 114 trainers has been formed, comprising government, industrial organization and private sector staff. This group is already in the process of passing on its skills to some 7500 managers and supervisors in 400 factories. During 2016, the newly trained managers will each start building awareness among their workers.

Recognizing the vital role labour unions can play in safety, the ILO is working closely with the National Coordination Committee for Worker Education (NCCWE) and Industrial Bangladesh Council. Through a training of trainers approach, the capacity of union leaders and organizers is being built. Similarly to their government and industry counterparts, these trainers will undertake workplace outreach activities to build awareness of occupational safety and health. At the same time, they are building knowledge among workers of their rights to a safer workplace. Special emphasis is placed on training women union leaders in recognition of the large numbers of women in the workforce, and to make it easier to reach out to them.

The ILO/IFC Better Work programme is also operational in Bangladesh, and is currently helping improve working conditions and productivity in over 90 factories. As part of their tasks, Better Work advisors work with factories to help enhance awareness of safety among the management and workforce.

Supplementing these actions that target the factory floor will be a series of advocacy actions aimed at spreading basic

A labour inspector checks first aid boxes in an RMG factory. The labour inspectorate plays a vital front line OSH role and has been strengthened through support of the ILO.

The Bangladesh RMG sector employs 4.2 million workers, most of them women.

Labour inspection checklists are being developed for a wide range of sectors including shipbreaking.

awareness of OSH to as many RMG workers as possible. Actions planned include a radio drama, songs and the use of celebrities to help build a culture of occupational safety and health.

In parallel streams of work, the ILO is also working to enhance awareness of labour rights. As part of this training, workers in the RMG, leather and shrimp industries are being helped to better understand their rights under the Bangladesh Labour Act, including those relating to workplace safety.

"At the workplace level we need to ensure that factory managers, supervisors and workers all have basic OSH understanding both in terms of practicalities and rights. The initial focus is always prevention, but if something happens we have to ensure that they know how to respond on the factory floor," says Tuomo Poutiainen.

In the aftermath of Rana Plaza it was clear that fundamental legislative and regulatory changes were needed. The revision of the Bangladesh Labour Act (2006) was identified as a priority to create a solid foundation upon which safety and better workers' rights in the RMG sector could be built.

The ILO provided support for this process, and the revised Bangladesh Labour Act, which came into force in July 2013, featured a number of new workplace safety related elements. A major step is the introduction of Safety Committees for any factory with over 50 workers. The main role of the Committees is to bring together management and workers to help create and maintain a safe workplace. Once functional, the committees will participate in the development, implementation and monitoring of company health and safety policies and procedures. They will carry out checks, help train workers, listen to OSH concerns from workers and help investigate and resolve them.

Following the issuing of the Implementation Rules of the Bangladesh Labour Act in October 2015, Safety Committees can now be established. The ILO supports this process by working with the Department of Inspections of Factories and Establishments (DIFE) to establish a number of committees as part of a pilot, which aims to establish 100 committees by the end of 2016.

"In the future, much of the emphasis of occupational safety work will be on creating workplace mechanisms to establish OSH. That is why the safety committees are so important, as ultimately they will become a locomotive of change," says ILO's Poutiainen.

To support the functioning of the committees, an 'OSH Kit' is under preparation. This will include materials to help the committee members both better understand key OSH issues and carry out their tasks. In addition to basic information on key OSH areas, the kits will contain checklists to help members carry out their daily/weekly checks, while basic forms (such as how to record meeting minutes) will provide practical support.

The Department of Inspections of Factories and Establishments (DIFE) is on the front line of efforts to enhance OSH. Following Rana Plaza, the DIFE was significantly upgraded by the government in terms of staffing, budget, resources, and status. The ILO has significantly supported the DIFE by providing comprehensive training to both newly recruited and existing staff. The labour inspectorate now rests on a stronger foundation following the development of an inspection roadmap and strategy. Also under development are standardised inspection checklists for various industries including RMG, tea and shrimp processing, as well as Standard Operating Procedures.

A more effective and efficient DIFE will make a huge contribution to enhancing OSH in Bangladesh. The inspectors are not only looking to catch out factories in which OSH is being neglected, but to provide advice and support for factories to become compliant.

As shown by its immediate strengthening of the DIFE in the aftermath of Rana Plaza, the Government of Bangladesh is deeply committed to enhancing OSH in the country as explained by DIFE Inspector General Syed Ahmed.

"The government is highly concerned about OSH activities and has already created an OSH policy. There is now an OSH Council under the Ministry of Labour and Employment with the DIFE acting as secretariat. The government also plans to establish an OSH academy. Inspectors working in DIFE will be trained in OSH issues and we are working closely with the ILO so that all people related to industry such as workers, managers and entrepreneurs are more aware."

↑ *Assessing an RMG factory for electrical safety. In the aftermath of the Rana Plaza collapse, all export-oriented RMG factories have undergone inspection for structural, fire and electrical safety.*

→ *The fire service plays an increasingly important role in ensuring building safety.*

In addition, a dedicated OSH unit has also been formed within the DIFE. The importance being placed on this unit is emphasized by the DIFE Inspector General.

"We will bring 69 inspectors into the new OSH unit. I myself will head this, as I think OSH is extremely important and worry that others may not understand the reality of the situation," he said.

Looking back over the three years since the Tazreen fire sounded the alarms on OSH in Bangladesh, much has been accomplished. Yet as Tuomo Poutiainen explains, huge challenges still remain.

"Every country has its own challenges and in Bangladesh, particular sectors such as construction, the informal economy, ship breaking and agriculture are fraught with OSH related issues.

"Through our actions in the RMG sector we seek to form better foundations for workplace safety and to build the capacity of the government, employers and workers to address OSH on a systematic and consistent basis. By doing so we hope that all sectors will eventually benefit."

For more information please see **www.ilo.org/dhaka**

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Occupational health and safety situation and improvements in the garment sector

General introduction to textile industry

Vietnam's textile industry, after 20 years of continuous development, and with an average growth rate of 15% per year, has risen to become one of the country's leading economic sectors, with exports contributing 10–15% to the annual GDP. Vietnam is one of the five leading textile exporters in the world, with a market share of 4–5%. The main export markets of Vietnam are the US, the EU and Japan (representing over 75% of annual exports). Garments are mainly made from cotton and synthetic fibres for the market's middle and low segments [1].

Currently, Vietnam has over 6000 textile enterprises,with about 2.5 million workers, which is about 25% of the country's industrial sector's labour force and nearly 5% of the total national workforce. Most of the enterprises in the private sector (84%), are concentrated in the Southeast and the Red River Delta (60%). Garment enterprises account for about 70% of all firms in the industry, spinning 6%, textile weaving 17%, dyeing 4%. Supporting industry accounts for 3% [2].

With the advantages of political, social and labor source stability, Vietnam's textile industry has many opportunities for growth in exports, especially when the trade agreement partners across the Asia-Pacific (TTP) was signed and the bilateral "Free Trade Agreement Vietnam – EU" (FTA) will be signed in the near future. The target is that by 2020, and by 2030 at the latest, the export and domestic market will have grown by 10–12% per year, in accordance with the Development Plan of the garment textile industry.

However, businesses in the textile industry still face many difficulties and challenges, such as deep integration with international markets; fierce competition among exporting countries; increasing trade barriers from major importing markets, especially from the US with the strictest social responsibility requirements; ecological labelling; and environmental protection [1].

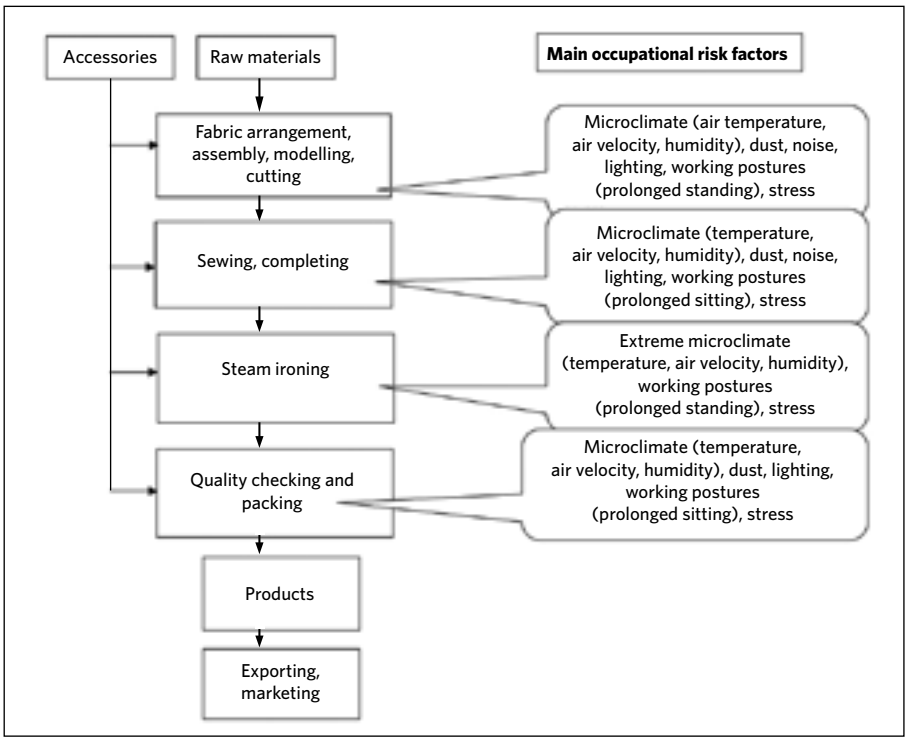

Figure 1. Main processing stages and occupational risk factors generated in working conditions of the garment manufacturing process

Vietnam's textile industry currently only participates in the third part of the global textile supply chain, that is, the garment manufacturing process: cutting and sewing, outsourcing which lack the ability to provide acomprehensive production and thereby add value only slightly. The garment manufacturing processes generally consist of four main stages: Stage 1 (fabric arragement, assembly, modelling, cutting), stage 2 (sewing, completing), stage 3 (steam ironing), and stage 4 (quality checking, packing). The production process is illustrated in Figure 1.

We will next describe the occupational safety and health situation and the improvements to working conditions currently being implemented in the garment industry.

OSH situation

As described in Figure 1, the specific working conditions of the garment industry are most affected by microclimate factors (air temperature, air velocity, humidity), ventilation, dust, noise, lighting, working postures (prolonged standing/sitting), stress, and potential fire risks.

In garment factories, particularly in the hot season, the air temperatures often exceed the threshold limit value (TLV) by 0.5–3°C and even 5°C in some workplaces, due to the intensity of solar radiation transmitted through the roof and walls in workshops, the great number of equip-

ment, the high number of employees, raw materials, semi-products, products, and the amount of heat generated during the operation of production machinery [3, 4].

With such working conditions and unsatisfactory heat protection systems, the ventilation systems operate insufficiently and cause air temperatures in the processing workshops to rise to 4–5°C higher than that outdoors. This situation makes employees feel hot and tired, which can potentially affect their health: acute manifestations of increased heart rate, body temperature changes, headaches, sweating, decreased concentration, memory loss, heatstroke, etc. Due to the large areas of garment factories and tightly located machines, installing ventilation systems to blow cool winds and create ventilated conditions for employees is difficult. How humid the air is in garment factories depends on outdoor humidity. In addition to this, in steam ironing workshops, water heat is used, which may create moist heat pollution in the work environment [5].

The research by authors Nguyen Dinh Dung, Le Thu Nga and colleagues in 2002 on the workload of ironing workers showed that employees must work in uncomfortable work environments with 50% of air temperature samples and 33.3% of humidity samples exceeding the TLV. None of the samples measuring air velocity met the TLV. Working intensity, working posture, working time, etc. were alarmingly high [5]. Another study by Pham Van Diu in 2006 on the work environment of two garment factories in Thai Binh city showed that air velocity and humidity did not meet the TLV (less than 1.5m/s and <80%, respectively), and that the cotton dust concentration was 0.2–0.8mg/m^3. In 2003, an investigation by the National Institute of Labour Protection in some garment factories in the South of Vietnam indicated that lighting intensity in these factories was low, at 200–280 Lux.

Recent research by Nguyen Thuy Quynh from the School of Public Health (2015) on the working conditions of female garment workers in some Southern and Central industrial zones showed that 61.5% of female workers were exposed to hot climates, 65.5% of them to dusts; 61.2% to noise. In addition, 13.2% of these worked in low intensity lighting, and 12.5% in excessively bright lighting. In some garment companies, 30% of noise samples exceeded the TLV in 2012 and 2013; similarly, in another garment company, 11% of noise samples, 32% of temperature samples, and 41% of lighting samples exceeded the TLV [6].

The results of Hoang Thi Thuy Ha's PhD thesis (Public Health at the Thai Nguyen Medical University) on the status of the work environment, health and illnesses of workers in 3 garment factories in the Thai Nguyen province showed that 41.7% of air temperature samples, 37.8% of the wet bulb temperature index, and 20–30% of dust samples exceeded the TLV [7].

According to the reports on occupational health activities by the Garment and Textile Health Center, the work environment in the garment and textile industry has not improved much. In 2006, 24.9% of the measured air temperature samples exceeded the TLV, whereas in 2010, 27.1% of these samples exceeded the TLV; the humidity samples almost exceeded the TLV as they were often equivalent to the outdoor humidity. The ventilation in some garment factories was insufficient as no equipment was installed to improve this situation. In 2006, 27.5% of these samples did not meet the TLV, whereas in 2010 this rate was 40.9% [8].

As well as the work environment, the working conditions in garment factories also consist of several risk factors. Trinh Hong Lan (2012) investigated the seats of garment workers in some factories, and found that they are unergonomic: they were mainly hard wooden seats with no backrest and unadjustable height. This situation caused musculoskeletal disorders in general, and low back pain in particular. According to another study by this author (2010), 83% of garment workers suffered musculoskeletal disorders, of which 54.3% were low back pain. There was a relationship between these disorders and working postures and work content ($p = 0.004$ and $p < 0.001$, respectively) [10]. In addition, garment workers work at high speed, for long working hours (mostly 10–11 hours/day) and have no breaks during their workshifts. This caused stress and fatigue: as much as 93% of garment work-

ers felt very tired after their workshift. The main symptoms were body fatigue (47%), headache (16.7%) and exhaustion (15.1%). Those working in monotonous tasks felt more fatigue than those working in diverse tasks [11]. Compared to before starting work, the workers' heart rate was significantly increased, blood pressure higher, and they made more mistakes in the Platonop concentration test after a workshift.

Health situation of garment workers

According to the occupational health report of the periodic health examination by the Garment and Textile Health Center, the main chronic occupational diseases suffered by garment workers were respiratory, gastrointestinal, gynecological and musculoskeletal diseases [12]. Acute occupational diseases were ENT diseases (45%); amblyopia (37.8%); constipation (30.3%); skin diseases (25.9%) and neurodegenerative diseases (8.7%).

Obviously, working conditions that do not meet hygiene standards negatively impact workers' health. This was demonstrated by a survey on the occupational safety and health (OSH) situation and social responsibilities of garment companies in an investigation into the health of garment workers after their workshifts. The survey results showed that garment workers had prominent headache syndrome (35%), dizziness (10.8%), sleeplessness (5.1%), stuffy noses (4.6%), sore throats (7.1%), itching (9.2%), chest tightness (4.6 %), and leg edema (4.8%). These symptoms were higher than those of the control group ($p < 0.05$). This survey also showed that in addition to the symptoms after the work shift, garment workers still had musculoskeletal disorders: back pain (41.2% male, 34.8% female workers); neck pain (37.4% male, 33.9% female); shoulder pain (28.2% male, 23.6% female); wrist pain (14.6% male, 11.6% female); low back pain (10.3% male, 8.7% female). Women had more of these disorders than men ($P < 0.05$) [13].

Research by Hoang Thi Thuy Ha on the status of some common diseases and associated factors in garment workers in some TN garment companies showed a high rate of acute nasopharyngitis (73.2%), nose diseases (34%), throat diseases (35%); bronchitis (8.1%), byssinosis (2.6%), and declined respiratory function (13.1%) among these workers. In addition, those working in assembly lines had a high rate of chronic diseases of the nose and throat, bronchitis, circulatory illnesses: chronic nasopharyngitis disease was 9.5%, chronic bronchitis was 4.5%, circulatory system diseases 6.8%, and eye diseases 4.75%. There were two cases of occupational byssinosis in particular. The nose and throat diseases and chronic bronchitis had a high incidence and occurred early in young workers. The rate of chronic bronchitis increased with work experience. The study also showed an association between using masks, paticipanting in OSH training and the rate of diseases. The rate of nose and throat diseases was three times higher in workers who did not use masks or used them incorrectly than in the group who used masks correctly. The rate of skin diseases among those working in sewing lines was three times higher in workers who did not participate in OSH training. The rate of eye diseases was lower in workers who used goggles than in those who did not [7].

Recent research results of the Hanoi School of Public Health (2015) also showed some signs of health problems in female garment workers after their workshift, such as musculoskeletal disorders (73.9%), neuropsychiatric symptoms (65.2%), respiratory symptoms (51.6%), hearing problems (37.1%), gastrointestinal problems (36.3%), and skin problems (22.4%). Of the health issues in the three months prior to the study, pharyngitis accounted for the highest proportion (35.4%), followed by migraine (23.5%), bronchitis (13.2%), gynecological problems (11.8%), and hearing loss (9%). Female garment workers' chronic diseases were stomach diseases – duodenum ulcers (9.4%), blood pressure (5.3%), rheumatoid illnesses (4.8%), chronic bronchitis (3.5%), colitis (3.2%), asthma (1.9%), depression and anxiety (1.6%), and occupational deafness (1.3%.) This study also indicated a relationship between work experience, education levels, working in a hot microclimate, monotonous work, working over eight hours/day, and the rate of musculoskeletal pains with a p-value of <0.05. There was also a relationship between age group, work experience, education levels and the rate of respiratory signs after a workshift with p-values of <0.05. [6].

Improvements to working conditions

There has been some research on improvements in the work environment in the garment industry aimed at promoting the health of garment workers through technological changes to the provision of personal protective equipment and enhancing health measures. However, due to the number of businesses and the enormous workforce of the garment industry, these improvements take a great deal of

time, effort and money. In addition, making decisions on improvements to working conditions often involves many stakeholders and this brings even further difficulties. To improve working conditions in the garment industry, Vu Van Dung provides three alternatives for ventilation in the garment and footwear industry. These depend on the condition of buildings, and the number of machines and workers. The advantages are that workshop air is replaced by fresh air; CO_2 concentration is decreased to permissible limits; the air temperature decreases, which helps workers who feel tired and sleepy; and ceiling fans are no longer needed, which reduces electrical power consumption. However, the researchers did not have specific figures [14].

Many garment companies have recently made improvements to working conditions, especially improvements at the level of secondary prevention, including improved cooling by installing steam rig technology. The cost of this new technology was very reasonable in comparison with that of installing central air conditionings or celling fans in terms of electrical power consumption [15].

The principle of the improvements is to create a difference between the temperature inside and outside the garment workshop via plate heat exchangers. During the hot days of high temperature and low humidity outside, the air is drawn in through the plate heat exchanger system (with water flowing through). As a result, the heat of the air is absorbed (process heat exchangers with high efficiency) through evaporation. So, the atmosphere inside the workshop is cool due to the exhaust fan system and this heat exchanger plate system and the temperature drops by 5–7°C as low wind, gas and hot air in the workshop is constantly being sucked out. During the cool weather and rainy days with high humidity outside, the air goes through the plate heat exchangers into the workshop (process heat exchangers with low efficiency). So, the atmosphere inside the workshop is decreases slightly. In addition, the humidity inside the workshop is fully controlled by the attached automatic control system. In the cold season, the exhaust fan system can be only used to ensure that the atmosphere inside the garment workshop meets the TLV. When installing this system, manufacturers often rely on sources of heat generated from equipment, lighting systems, people, solar radiation, and the heat insulation of the factory for calculating the flow of the exhaust fan as well as the area of the plate heat exchangers or water volume for the plate heat exchangers [15].

Research by Le Thu Nga (2010) "Assessment of application efficiency of working condition improvements with cooling methods using steam rigs in an ironing workshop" showed that microclimate conditions were much better after an intervention (average temperature: 29.8°C – 30.6°C; humidity: 78.82–79.28%; wind speed: 1.55±0,05m/s – 1.59±0,09m/s) than before the intervention (average temperature was 34.9–35.6°C; humidity: 79.05–80.88%, wind speed from 0.57–1.27m / s). The severity of the impact of a combination of microclimate factors before improvements on the work environment was Category III (39.95 to 42.5). This decreased to Category I and II after the intervention (17.9–28.25 °C). Psychological and physiological indexes (heart rate, body temperature, blood pressure, memory and concentration capacities, etc.) significantly changed after the intervention, and admissions of workers to health care facilities fell significantly. The improvement efficiency index was 74.4–74.3. The number of sick leaves also fell after the improvements, with efficiency indicators of improvement from 61.2 to 68.7. Acute diseases and symptoms diminished significantly. The author suggested expanding these improvements to other garment companies [16].

At a garment company, Nam Dinh province, a factory system was designed to be cool in summer and warm in winter, fulfilling fire and explosion prevention re-

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quirements with multiple exits. The company also invested in industrial electronic sewing machines, in line with the modern European technology of high productivity, quality and safety; arranged reasonable production lines; and invested in ventilation systems and vacuuming systems to reduce the temperature in the factory (4–5 °C) and to minimize dust and noise during production. In addition, a proper standard lighting system was installed to ensure sufficient lighting for workers. The company organizes annual OSH training and provides adequate uniforms and personal protective equipment. As for workers who perform heavy and dangerous tasks, operate machines with strict security and OSH requirements such as boilers, compressed gas cylinders... are provided with skill training on safety, occupational health and fire prevention. [17]

Another garment cooperation focuses on ensuring OSH through very specific actvities: in garment factories, ventilation systems were equipped with fans instead of a cooling system, which reduced indoor air temperature by 4–5 °C in comparison with that outdoors, and reduced dust and noise at workplaces. Fluorescent lamps were installed to ensure the provision of standard lighting levels and to reduce harm to workers' eyes in sewing and embroidery factories. In addition, the company installed a radio system in all plants for everyday business communication, working rules and regulations, carried out OSH activities, and ensured fire and explosion protection for all the company's officers and workers. The OSH committee monthly checks all OSH criteria in each enterprise, workshop and department, and encourages employees to actively participate in these activities by giving bonuses to limit health risks generated during the manufacturing process [17].

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Photos by Santu Durlov

A worker weaving Sari (Traditional cloth worn by Indian women) on a traditional loom

Subhashis Sahu, Santu Durlov, India

Handloom weavers in India: An occupational physiological perspective

The handloom is part of traditional cottage industry in developing countries such as India, Pakistan, Bangladesh, Iran, Turkey, and China. It is reported that there are about 4.6 million handlooms in the world, of which about 3.9 million are in India [1]. Weaving is acknowledged as one of the oldest surviving traditional crafts in the world. In the present era of mechanization and standardization, the handloom sector provides an exclusive richness of diverse manual skills, representing cultural and traditional art forms [2].The government of India has taken several steps towards promoting the handloom industry, ranging from endorsing handloom products in the global market, to providing training facilities for developing weaving skills in different institutes and centres [3].

The handloom industry is a rurally based cottage industry, in which spinning, weaving and other processes are mainly carried out manually. It encompasses a wide range of tasks, such as manual sorting of raw materials, dyeing, cutting, starching, adjusting looms, arranging thread, and inserting spindles [4, 5].

Although weaving appears to be a very simple process, in reality it involves hard work and has many stages. It includes a number of occupational risk factors such as awkward posture, high force, repetitiveness, long duration of work, and high visual demand. Weavers use hand-operated looms that require sitting and operating foot pedals. Handloom weavers use two types of loom; the traditional loom and the jacquard loom.

The jacquard loom requires comparatively more investment and training, but makes designing easier, which in turn improves productivity. However, weaving with a jacquard loom is physiologically more strenuous [6].

There are two types of work stations for handloom weavers – i) the bench-

type work station, and ii) one in which the weaver sits on the floor or on a plank with their leg hanging to operate the pedals placed at a ditch.

Occupational health problems of handloom weavers

Most handloom weavers are from poor socioeconomic backgrounds. They have to work in ill-ventilated rooms with poor lighting. In summer, the conditions worsen due to higher room temperature and humidity, especially in tropical regions. Studies have shown that pain in different body parts is their main complaint. Other complaints include respiratory problems, eye problems, poor digestion, and sleep disturbances [7, 8].

Musculoskeletal disorders (MSDs)

A high prevalence of self-reported MSDs, influenced by multiple stressors, was found among handloom weavers in Gujrat [5]. Studies in other parts of India such as Assam [2], West Bengal [4, 6], Tamil Nadu [8] also report a prevalence of pain in different body parts. Among these, the most common was low back pain (LBP) [4, 5, 6].

Weavers' MSDs arise from a number of factors, the most relevant being a constrained sitting posture for prolonged time periods [4, 5]. Other factors are inadequate workspace, strong muscle exertion and repetitive movement of the limbs [2, 4].

With the introduction of jacquard, constant flexion of the spine for motif formation and the load on the cervical spine has decreased. However, pulling the

A weaver working on a jacquard loom

→ *Bench-type work station of handloom weaver*

↓ *Other type of workstation*

A weaver working with a newly-designed seat

warp thread upward in the jacquard, and the additional force required for using the treadle, increases tension and pressure on the leg muscles [2, 6].

The results of the Oswestry Low Back Pain Disability Questionnaire concluded that participants had minimum disabilities and were able to cope with most daily activities [4].The prevalence of back and knee pain was higher among female handloom weavers. [5]. A comparative study reported that rest pauses during the work is an important factor for preventing MSDs among handloom weavers [9].

Self-ratings of the body part discomfort (BPD scale) showed that the maximum discomfort felt is in the lower back, followed by the head, waist and fingers [7]. The intensity of low back pain was significantly associated to the years of exposure in the weaving job [4, 5]. Another study observed no significant relationship with chronological age [7]. Thus, the duration of the work and the year of exposure are the most likely causative factors of MSDs.

Other health problems

In most handloom weavers' workstations, the level of lighting is very poor, even in the daytime [7]. So, as weaving is a fine visual task, this strains the eyes. Handloom weavers also complain of different gastrointestinal problems such as diarrhoea, dysentery, hyperacidity, etc. They also suffer from respiratory problems, for example, shortness of breath [7, 8]. A study of weavers showed a decline in peak expiratory flow rates due to exposure to cotton dusts [10].

Ergonomic interventions

In handloom weaving, seating posture cannot be altered, as it is task specific. Thus, modifying seating would be a low-cost option to reduce harmful effects. Pandit and Chakraborti (2014) redesigned weavers' seats by modifying the depth and front edge of the seat plank and providing a back rest [11]. We designed a low cost seat to reduce strain to the thigh muscles. The weavers approved of this seat. However, an elaborative study is required in order to redesign weavers' work stations.

As well as design, the work-rest cycle should be modified, and intermittent breaks should be provided. Proper ventilation, lighting and exhaust fans are essential to improve the work environment. A detailed ergonomic study is also required to mitigate the occupational stress of handloom weavers.

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Prevalence of neck and upper limb MSDs among female apparel workers in the Biyagama export processing zone in Sri Lanka

The garment industry, with 1060 garment factories, has become Sri Lanka's largest exporter, providing more than 330 000 direct jobs (87% females). Although musculoskeletal disorders (MSDs) have been identified as a predisposing factor for decreased productivity, there was no validated tool for assessing these in the Sri-Lankan context. This study attempted to develop this essential tool in order to be able to assess musculoskeletal disorders of the neck and upper limbs. It comprises three components; item selection, item reduction through pilot studies with principal component analysis, and validation.

A literature review was carried out to generate a pool of symptoms of neck and upper limb MSDs. The operational definition was developed on the basis of the derived symptoms, and its content validity assessed by a panel of experts.

A tentative self-administrated questionnaire was developed, translated into Sinhalese and pre-tested among ten female garment workers. A pilot study and principal component analysis was carried out among 350 female workers to remove unimportant items. Verimax with Kaiser Normalization was followed by a rotated component matrix. We assessed the content validity and criterion validity of the final version of the tool. A physical examination by a rheumatologist was considered the "gold standard". We produced separate ROC curves for each body part, and determined the sensitivity and specificity of each subsection with symptoms of pain in the neck (83.1%, 71.7%), shoulders (97.6%, 91.9%), elbows (98.2%, 87.2%), and wrists (97.6%, 94.9%). Cronbach's Alpha and the correlation coefficient of each subsection was above 0.7. Therefore we conclude that this tool has very high sensitivity and specificity, and good internal consistency and test re-test reliability. It was named the Neck and Upper Limb Musculoskeletal Disorder Questionnaire (NULMSDQ), and was used to assess the prevalence of neck and upper limb MSDs. We obtained the following results: prevalence of work-related neck and upper limb MSDs, 54.9%; work-related neck MSDs, 33.1%; and work-related thoracic outlet syndrome, 30.2%. The prevalence of work-related shoulder MSDs, work-related rotator cuff syndrome and work-related tension neck syndrome prevalence were 36.9%, 30.6%, and 27.9%, respectively. The prevalence of work-related elbow pain, epicondylitis, wrist MSDs, dequararions, and carpal tunnel syndrome was 21.5%, 10.6%, 14.7% 7%, and 5.8%, respectively. Furthermore the prevalence of having one, two, or three disease conditions and all four disease conditions at the same time was 18.7%, 23.5%, 11.0%, and 1.8%, respectively.

Photo @ International Labour Organization / Perera Y.R.

Cloth cutter work in clothing industry

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Occupational health and safety of garment workers in Bangladesh: Updates and evidence need

Background

Bangladesh is the eighth largest country in the world in terms of population, and a large segment of its working-age young female population is employed by garment factories that manufacture clothes for Western countries. Bangladesh currently has about 4000 garment factories, which employ over 4 million workers. Most of these workers are young women (17–35 years) who migrate from rural areas to the capital city Dhaka and its vicinity for these jobs and are usually paid about USD 80 a month. The garment industry is critical to the national economy as the primary source of employment and foreign currency. Bangladeshi garment workers mostly work in very difficult conditions within these factories, with minimal workplace health and safety regulations, programmes, policies, or practices [1].

A series of major disasters over the last several years, including a fire incident that killed 112 workers, and the collapse of a factory building that killed 1122 workers, have provoked widespread calls domestically and internationally to improve the workplace health and safety situation in this industry. These incidents have also focused global attention on the very low wages, benefits and facilities at these factories in Bangladesh, the second largest global exporter of clothes after China. Simple workplace policies and practices, such as ensuring building and electrical safety, firefighting capability, and access to appropriate emergency exits could have prevented the loss of many lives. Recent funding and initiatives led by European and North American retailers [2, 3] have focused exclusively on fire, building and electrical safety, ignoring the fact that most of these workers also suffer from a host of other acute and chronic workplace health issues. These non-

fatal health conditions, non-traumatic in nature, attract little attention, despite numerous anecdotal and news media reports suggest that these factory workers may suffer from machinery injuries, cuts, burns, slips/falls, as well as chronic health issues such as back and shoulder pain, fatigue, vision loss, headache, hearing loss, respiratory problems, chest discomfort.

The ILO Constitution sets forth the principle that workers be protected from sickness, disease and injury arising from their employment. Due to mounting social and public pressure and rising consumer expectations, enterprises need to go beyond their legal requirements and act more responsibly. Creating workplaces that are safe and healthy for their employees and preventing injury, illness and disease is one way in which companies can meet these increasing expectations, while also improving productivity and competitiveness. Workplace injuries, illnesses and disabilities cause physical, financial and emotional hardship for individual workers and their families, as well as loss of business, reduced productivity and other financial difficulty for employers. In industrialized nations with strong protective policies and practices in the workplace, including improved ergonomics, industrial hygiene practices and engineering controls, workplace health and safety has improved greatly. The vast majority of workers who are assessed and treated for work-related illness or injury return to work without unexpected delays or disability. However, this is not the case in developing countries.

Existing evidence

Studies on garment workers' health and safety status in developing countries are rare. The studies that have looked into these issues are largely descriptive such as case reports, case series, or cross sectional in design, which limits the ability to identify and correlate risk factors/hazards with health outcomes. Small sample size, ad-hoc or pilot scale data collection makes the study findings less reliable and valid. There is a great need for large scale epidemiological studies to systematically identify and collect data on workplace risk factors and hazards, socio-demographics of workers and relate these to health outcomes. Some previous studies have highlighted some of the following health issues and hazards among these workers:

Heath outcome

- musculoskeletal symptoms & disorders
- respiratory symptoms, lung functions
- chest discomfort
- headaches
- weight loss
- fatigue
- vision and ear complaints
- body pain
- dyspnoea
- stomach ache
- swollen fingers
- heartburn
- hoarseness of voice

Work hazards

- ergonomic issues: prolonged squatting or awkward position; workstations not adjusted to machines with respect to height and distance and personal space
- not enough breaks and practising of stretching bodies
- exposure to chemicals and toxins
- loud noise
- inadequate light
- temperature control
- fibre dust exposure
- inadequate or inappropriate use of machines guards, needle guards
- Lack of Personal Protective Equipment (PPE): hair or wearing clothe can be trapped in machine, finger guards, respiratory protection, eye and ear protection
- Special protection for workers in chemical rooms, boilers

The Alliance for Bangladesh Worker Safety – a network of largely North American retailers – conducted a large, comprehensive study in late 2013 to describe the existing health and safety situation [2, 4]. This study captured quantitative and qualitative data through survey and off-site focus group discussions. About one third of the workers reported that their job negatively affects their health. Two-thirds of the surveyed workers reported feeling body pain after a day's work. Neck pain, pain in legs and/or feet and headaches were commonly reported. Workers from the sewing and packing departments reported pain more often. More than half of the workers reported to have experienced or witnessed accidents at work. Fire accidents, machinery-related injuries, and electric shock were more commonly reported [4].

A few studies have also looked into the positive socio-economic changes brought about by the massive number of stead-earning jobs created by this rapidly growing sector [5].

Developing a factory-level workplace health and safety surveillance system

To help develop sustainable injury and illness prevention programmes for these garment factories, there is a great need to create a factory-level workplace health and safety surveillance system to systematically understand the cause, nature and severity of injuries and illnesses, and to implement and evaluate workplace health and safety interventions. Surveillance data would determine epidemiological patterns and identify high-risk working populations and areas within and across factories, and allow the examination of time trends. The US based retailers and other international stakeholders are actively working to create occupational health and safety committees at these factories. Ongoing data availability from these surveillance systems will be vital to make these committees functional.

Surveillance data will help identify the common cause, nature and severity of injuries and illnesses as well as the high-risk population groups with respect to gender, department, education, age, occupation, and department. Workers should be continually monitored to assess their knowledge about existing hazards, awareness of the health consequences and use of available protective measures, and their perception of the risk of their jobs. Occasional off-site qualitative data collection will provide workers with the additional opportunity to share their experiences and stories more in depth, which may not be captured in a structured surveillance data system in place inside the factory.

Physical, ergonomic and chemical hazards can be detailed through periodic inspections by teams of ergonomists, civil engineers, chemists, industrial hygienists and epidemiologists, who would conduct assessments of the prevailing hazards by taking samples and measures from each floor and department in these factories so that progress can be monitored and reported (e.g., noise, light intensity, $C0_2$, dust and particulates, temperature, sitting posture; the availability, quality and use of control measures such as personal protective equipment including earplug, mask, goggles, needle guards for fingers, etc.).

A workplace health and safety surveillance tool can then be developed. A simple, one-page data collection tool can be drafted and piloted in these factories with the active collaboration of factory level health and safety committee members and management. Such a tool should be promoted at these factories as the preferred, exclusive way for workers to report all injuries, near-misses, and incidents. Hardcopy, telephone and electronic versions of this tool should be made readily available, and workers should be assured of their anonymity when they report. The data collected should be analysed for contents and quality, and the trends and patterns of injuries, incidents and illnesses need to be presented and discussed with the factory level health and safety committees in their regular monthly meetings to determine how useful the data have been in making health and safety related deci-

sions and find ways to improve the data collection tool and process.

Conclusions

Having one uniform, standardized workplace health and safety surveillance tool across factories would help all stakeholders, including the factory management, worker groups, foreign retailers, factory auditors, and the health and safety committee members remain well-informed and continuously updated about the prevailing health and safety issues. A comprehensive attempt should be made by the stakeholders including industry associations, government ministries, NGOs, worker advocacy groups, worker unions, foreign buyers, and development partners to understand the injury and illness profile of Bangladesh's garment workers [6].

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Pesticide Training in Nepal: A discipline with room for improvement

Introduction

Chemical substances, including pesticides, have traditionally contributed to the maintenance of high yielding agriculture, thus many countries have extensively used pesticides to increase agricultural productivity. Currently over 900 pesticides are used worldwide, both legally and illegally, to control a variety of agricultural pests that cause yield losses [1]. The use of pesticides in agricultural production is growing the fastest in developing countries, where farmers are increasingly relying on pesticides as a major means of increasing their harvests [2].

In Nepal, chemical pesticides are commonly used in the agricultural sector, which has the highest application rates in vegetable production. It is estimated that Nepal annually imports approximately 345 tons of active ingredient pesticide, composed of 29% insecticides, 61% fungicides, 8% herbicides and 2% others. Of this amount, it is estimated that 85%, corresponding to 293 tons of active ingredient, is applied in vegetable production [3]. The widespread lack of pesticide awareness among Nepali farmers leads to overuse in terms of dose and frequency. It also results in the use of banned and unregistered products, incorrect application techniques, limited use of personal protective equipment, lack of pre-harvest waiting periods, and illegal post-harvest application before delivering food products to the markets. This indiscriminate use of chemical pesticides, combined with a lack of knowledge regarding pesticides, which prevents consumers from performing food processing before consumption, leads to adverse effects on human health. It is estimated that in Nepal, the annual costs of illness due to pesticide use are $16.8 per household [4]. Despite such societal costs, it has been argued that farmers in developing countries will continue to use pesticides in increasing quantities due to ignorance regarding the sustainability of this use, lack of sufficient alternatives, underestimation of the short and long-term costs of pesticide use, and weak enforcement of laws and regulations [5].

To contribute to food security, human health and environmental protection, the

Barefooted boy sprays pesticides without using personal protection equipment.

Nepali Government accepted integrated pest management (IPM) as part of their plant protection programme in 1990 [6]. Since then, many activities have been implemented by governmental and non-governmental organizations in order to raise the level of knowledge regarding pesticides and to enhance production practices among Nepali farmers. Training activities have mainly involved the farming sector, and to some extent have neglected the remaining part of the Nepali population, who are even more unaware of the potential dangers of pesticides and how to protect themselves from poisoning.

The aim of the present study is to increase understanding of the effect of farmer training by testing Nepali vegetable farmers' knowledge regarding pesticides and comparing it to that of vegetable retailers and vegetable consumers. A further aim is to discover human characteristics that can be used to predict levels of knowledge regarding pesticides, with the purpose of customizing the future pesticide training of farmers and the educational activities of the general public.

Our hypotheses are as follows:

- Vegetable farmers are more likely to have better knowledge regarding pesticides than vegetable retailers and consumers, due to training, practical experience and exchanging experiences with other people from the agricultural sector.
- Human characteristics, such as gender, age, education and occupation, influence the level of knowledge and can be used advantageously in order to customize future pesticide training.

How did we do it?

A comparative cross-sectional survey was conducted by collecting data from vegetable farmers, vegetable retailers and vegetable consumers in the Chitwan district of Nepal during February 2015. Chitwan covers an area of 2205 square kilometers and had a population of 579 984 in 2011 [7]. The district was chosen because it is one of the main vegetable cultivation areas with a high volume of pesticide usage. Agriculture is the primary source of income for the population of the district [7].

The investigator and a field assistant visited six different sites in Chitwan to retrieve data by means of a questionnaire in face-to-face interviews. A total of 95 respondents, consisting of 30 vegetable farmers, 30 vegetable retailers and 35 vegetable consumers, took part in the survey. Vegetable retailer and vegetable consumer interviews were conducted in five vegetable markets located in four village development committees (VDCs): Bharatpur NP, Bhandara, Khairahani, and Ratna Nagar NP, while data on vegetable farmers were collected from a farmer's co-operative located in a fifth VDC: Mangalpur. Vegetable retailers and vegetable consumers were randomly selected at the markets, using no selection criteria. All vegetable farmers were members of the local farmers' "Gyanaswor Taja Vegetable Cooperation", which provided names, addresses, and contact information on 30 random members. This enabled the interviews to be conducted at their private addresses.

Significant differences between groups were investigated by the means of contingency tables [8]. Multi way ANOVA was performed to investigate the effect of four explanatory categorical variables on the quantitative response variable. The four categorical explanatory variables were gender, age, education and occupation, and the quantitative response variable was a knowledge score, indicating knowledge level. In the ANOVA model, age was divided into four categories: 0–20, 21–40, 41–60 and >60 years. Education was divided into two groups: illiterate and educated, assuming a considerably lower knowledge level among illiterate people than among those with all other levels of education. Occupation contained the following categories of employment: private job, business job, farming job, and governmental job. The knowledge score, given as the ratio between the correct answers and the total number of questions, indicated pesticide knowledge level.

All respondents participated voluntarily and the data were treated in a confidential manner; only the investigators had identity access.

Table 1. Outcome of questions on knowledge regarding pesticides among vegetable farmers, vegetable retailers and vegetable consumers in Chitwan, Nepal. The estimates describe the proportion of correct answers to the 2–5 multiple choice questions (number of options given after the questions), given as both an exact number and percentage for each group. P-values describe the similarity between the groups.

Vegetable farmers (N=30)	Vegetable retailers (N=30)	Vegetable consumers (N=35)	P-value	Vegetable farmers (N=30)	Vegetable retailers (N=30)	Vegetable consumers (N=35)	P-value
What is a pesticide? (4)				Which pesticide group is most toxic to human health? (4)			
12 (40%)	10 (33%)	5 (14%)	0.056	7 (23%)	6 (20%)	8 (27%)	0.944
Do you know the target organisms of insecticides? (2)				Can vegetables contain pesticide residues? (2)			
22 (73%)	9 (30%)	13 (37%)	0.001**	25 (83%)	20 (67%)	30 (86%)	0.133
Do you know the target organisms of fungicides? (2)				Do you wash your vegetables before consumption? (2)			
12 (40%)	5 (17%)	4 (11%)	0.015*	25 (83%)	16 (53%)	23 (66%)	0.045*
Do you know the target organisms of bactericides? (2)				What is the importance of a postharvest waiting period? (4)			
1 (3%)	4 (13%)	3 (9%)	0.426F	28 (93%)	20 (67%)	26 (74%)	0.037*
Do you know the target organisms of herbicides? (2)				How do pesticides enter the human body? (4)			
0 (0%)	3 (10%)	4 (11%)	0.187F	21 (70%)	13 (43%)	17 (49%)	0.087
Which colour label symbolizes most toxic pesticides? (4)				Do pesticides mostly affect the health of children? (4)			
18 (60%)	4 (13%)	3 (9%)	2.4e-06**	11 (37%)	2 (7%)	0 (0%)	1.7e-05**F
Which colour label symbolizes least toxic pesticides? (4)				Do pesticides have a negative environmentally impact? (5)			
11 (37%)	3 (10%)	2 (6%)	0.002*	25 (83%)	25 (83%)	31 (89%)	0.816F
Do pesticides have negative effects on human health? (2)							
27 (90%)	23 (77%)	33 (94%)	0.102F				

p < 0,05 (significant)
***p < 0,001 (higly significant)*
F: Fisher's exact test is used

Results

Table 1 shows the group differences in pesticide knowledge. Vegetable farmers had a significantly higher rate of correct answers in seven out of 15 questions on different topics regarding pesticides. However, all three groups of respondents had difficulties explaining what a pesticide is: only 40% of the vegetable farmers, 33% of the vegetable retailers and 14% of vegetable

Field assistant, Atish Pandit, interviews a vegetable consumer at a vegetable market.

A group of pesticide retailers having just completed a two-day training session on safe pesticide handling

Tomatoes with pesticide residues

consumers answered correctly (p=0.056). The majority of the remaining respondents, corresponding to 55%, referred to pesticides as drugs for human diseases.

Vegetable farmers managed to achieve an average proportion of 54.4% of correct answers, which is significantly higher than those of vegetable retailers and vegetable consumers, which were 36.2% and 38.5% (p=9.788e-09), respectively.

An initial model, including gender, age, education, and occupation as explanatory variables and the knowledge score as a quantitative response variable was constructed in order to test the hypothesis that human characteristics influence the level of knowledge regarding pesticides. Education (p=0.046) and occupation (p=0.011) were exclusively observed as having a significant influence on the knowledge score, whereas gender and age had no significant influence (p=0.98 and 0.74, respectively). The nine participating illiterate respondents achieved an average knowledge score of 0.30, while the 86 participating educated respondents achieved an average knowledge score of 0.47.

Discussion

This study showed, as expected, that vegetable farmers possess a significantly higher level of knowledge regarding pesticides than vegetable retailers and vegetable consumers, most likely due to their practical experience with pesticides, pesticide training and acquaintances with the agricultural sector. However, the farmers still answered only 54.4% of the total number of questions correctly, which indicates a rather basic pesticide knowledge level. It was rather surprising that only 40% of these were aware that pesticides are used to prevent weeds, diseases and pest in-

Sundar Tiwari gives pesticide retailers a lecture on safe pesticide storage, management and sale.

sects in crops, and that over 50% referred to pesticides as drugs for human diseases. Several other studies (e.g., [9]) have also investigated the level of Nepali farmers' knowledge regarding pesticides, and all report disturbingly low levels of knowledge. This can lead to unnecessarily excessive use of pesticides, and neglect of their own safety and consumer health; a problem that has been greatly debated in the national news [10]. Despite the local public debate, vegetable consumers do not always process pesticide-treated foods before consumption. The present study found that 47% of the vegetable retailers and 34% of the vegetable consumers did not carry out any residue-reducing processes before consumption. The reason for the excessive use of pesticides and the lack of vegetable processing before consumption is expected to be related to the high rate of illiteracy among the Nepali population. Illiteracy was also one of the significant explanatory factors in the present study. An estimated 49% of the adult Nepali population are believed to be illiterate [11]. However, less than 10% of the participating respondents of the present study were observed as illiterate. This low occurrence in the present study may be a coincidence, but it is more likely that some respondents may have pretended to be educated to avoid being labelled illiterate.

A range of knowledge and awareness raising activities have been organized for Nepali farmers to improve their knowledge on pesticide use and thereby reduce the occurrence of severe, acute pesticide poisonings. However, several studies show a need for further knowledge raising activities [9]. The results of the effects of different human characteristics and their impact on pesticide knowledge in this study show, as mentioned above, that education has a significant impact on pesticide knowledge. On the basis of this observation, we recommend that future pesticide training be customized to the educational background of the participating farmers. Dividing the training participants into groups on the basis of their knowledge level allows the training material and teaching to be adapted more accurately to match each participant. Training activities have formerly involved the farming sector and have to some extent neglected the remaining population. Hence, despite most vegetable retailers and consumers being aware of pesticide residues in vegetables, many do not wash their vegetables before consumption. This observation confirms a widespread ignorance of the existence of chronic pesticide intoxication, which has also been argued in other studies [12]. To raise general awareness of pesticide toxicity and pesticide residues in food products among Nepali consumers, we recommended highlighting the problem in newspapers, street advertisements, on television, etc. In order to ensure good understanding, these campaigns should be based on oral and illustrative materials rather than on text.

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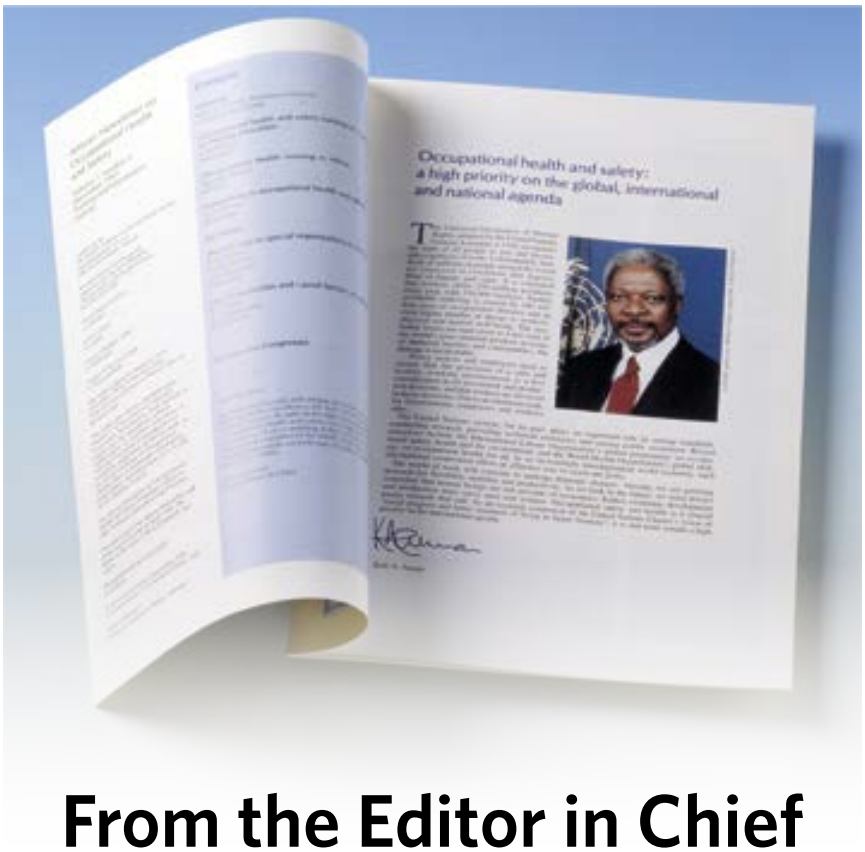

From the Editor in Chief

The power of information is strong and ground breaking. The story of the Regional Newsletters published by the Finnish Institute of Occupational Health (FIOH) is evidence of this.

The East African Newsletter of Occupational Health and Safety was established in 1987. A sister regional newsletter was established in 1994 for the Asian-Pacific Region, along the lines of the Asian OSH Programme of the ILO, and funded by the Finnish Ministry for Foreign Affairs.

Over twenty years of activity, a total of close to 600 articles and reports on activities in the Region, and meetings and their results have been published to raise awareness and increase the information base of occupational health and safety experts in the Asian-Pacific Region and worldwide. In addition, the Newsletter has also offered a channel for international experts, decision-makers and policy-makers to share good practices and solutions with colleagues in the Asian-Pacific Region.

An important aspect of the editing and publishing of the thematic issues of the Newsletters has been the honour we have had in obtaining Editorial messages from the highest organizational levels of the International Organizations. These include Mr. Kofi Annan, Secretary General of the UN; Dr. Gro Harlem Brundtland, Director General of WHO; and Mr. Juan Somavia, Director General of ILO. And now more recently, at the beginning of this year, we had the privilege of receiving a message from Mr. Guy Ryder, Director General of the ILO. These messages have indicated the importance of occupational health and safety, and have encouraged actors at the national level to strengthen their efforts in developing working conditions, occupational safety and occupational health in their countries, thereby improving workers' health and work ability. World Leaders have clearly stated that Occupational Health and Safety is a fundamental human right.

We have received a great deal of positive and encouraging feedback on the Newsletter from readers in 120 countries, as well as from the International Organizations. However, despite the fact that there seems to be a need and demand for this kind of information dissemination, the new leadership of FIOH did not find a possibility to continue the editing and publishing of the Asian-Pacific Newsletter or of our two other Regional Newsletters, as of the beginning of 2016.

We at the Editorial Office have been in contact with some prominent Institutes in the Region in order to find a new host for the Asian-Pacific Newsletter, so that the publishing of the Asian-Pacific Newsletter on Occupational Health and Safety can be continued.

On behalf of FIOH, the Distinguished Founding Fathers of the East African Newsletter (the basic idea), myself and the Editors, I would like to take this opportunity to warmly thank all the writers, contributors, experts, and readers for their attentive support, for giving their time, and for sharing their expertise for the benefit of the readers and workers of the world. The readership also deserves a warm thank-you for keeping the information flow vivid. Very special thanks go to the International Organizations, ILO, WHO and ISSA, and the Finnish Ministry for Foreign Affairs as well as the Finnish Ministry for Social Affairs and Health for their financial support over the years, in addition to their non-financial contributions.

We greatly appreciate all that you have done. Thank you so much!

Suvi Lehtinen
Editor in Chief

Editorial Board

as of 1 August 2015