Reducing Dietary Related Risks associated with Non-Communicable Diseases in Bangladesh (RDRNCD)

Technical Report
Health literacy perspectives in non-communicable diseases: Knowledge, attitude and practice related to pesticide use among vegetable producers in Bangladesh

Submitted by:

Center for Natural Resource Studies (CNRS)

House-13 (Level 4-6), Road-17, Block-D, Banani, Dhaka-1213

Tel: (+880-2) 9820127-8, E-mail: info@cnrs.org.bd

Web: www.cnrs.org.bd

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Dr. AKM Shahidullah[a], M. Anisul Islam[b]

[a]Dr. AKM Shahidullah
Lecturer in Entrepreneurship and Innovation
Tasmanian School of Business & Economics
University of Tasmania
Phone: +61362266239
Email: shahid.akm@gmail.com

[b]M. Anisul Islam
Director and overall coordination
Center for Natural Resource Studies (CNRS)
Phone: +8801711813407
Email: anis@cnrs.org.bd

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www.cnrs.org.bd info@cnrs.org.bd

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1.0 Introduction

This chapter begins with a brief focus on health literacy while attempting to interpret and evaluate the status of knowledge, attitude and practice (KAP) on use of pesticide in vegetable production. It illustrates the degree of literacy on the relation between non-communicable disease (NCD) occurrence and exposure to pesticide among the adult population of six districts in Bangladesh. Finally, it presents a discussion on the importance of enhanced KAP as part of health literacy of growers and farmers of vegetables with respect to the use of pesticides.

Health literacy (HL), a relatively new concept to the public health knowledge domain, is becoming increasingly significant not only for health promotion but for understanding non-communicable diseases (NCDs) also (Vamos & Rootman, 2013). The importance of HL in influencing general health conditions of individuals is well-established and is regarded as the essential capacity to live a healthy life (Schwartzberg et al., 2007; Hope et al., 2004; Baker et al., 2002). Unlike general literacy, which is the capacity to read, write and have basic numerical skills (Kickbusch, 2001), a widely used HL definition is "a cognitive and social skill that determines the motivation and ability of individuals to access, understand, and use information in ways that promote and maintain good health" (Nutbeam, 1998, p. 350). Among other definitions that have emanated in the health literature, Zarcadoolas et al. (2006) consider HL as the consolidated skills and competencies through which individuals develop to seek out health information and concepts to make informed choices, reduce health risks, and increase quality of life. After a systematic review of the HL definitions that evolved over time, Sorenson et al. (2012, p.9) defined HL more comprehensively, asserting that:

> "Health literacy entails peoples' knowledge, motivation, and competencies to access, understand, appraise and apply health information in order to make judgements and take decisions in everyday life concerning healthcare, disease prevention, and health promotion to maintain or improve quality of life during the life course."

The spectrum of HL calls for understanding non-communicable diseases (NCDs). NCDs are chronic; the common and predominant kinds are cardiovascular diseases, cancers, respiratory diseases and diabetes. They are the result of a combination of genetic, physiological, environmental and behavioral factors and cause most deaths worldwide every year (Bloom et al., 2011). Wand et al., (2016) figures out that NCDs kill 41 million (m) people each year, equivalent to 71% of all deaths globally. Cardiovascular diseases account for most NCD deaths, or 17.9 m people annually, followed by cancers (9.0 m), respiratory diseases (3.9m), and diabetes (1.6 m) – 80% of these deaths happen to be premature (Anderson et al., 2016).

Numerous studies find that NCD occurrence is greatly linked with low level of health literacy (Rootman & Gordon-El-Bihbety, 2008; Murrey et al., 2008; Bloom et al., 2011; Vamos & Rootman, 2013). Conversely, good degree of health literacy (HL) or improved HL among people has been found to be associated with better health outcome and is a critical factor in managing NCDs (Schillinger et al., 2002; Johnston et al., 2006; Rosefield et al., 2011). Studies also reveal that the knowledge specific to NCDs is reciprocated with health literacy as interventions towards improved literacy level have been found to reduce health disparities in NCD management (Gazmararian et al., 2003; Paasche Orlo et al., 2005).

1.1 Pesticide use vis-à-vis non-communicable disease: Bangladesh

Pesticides contact, especially long-term exposure, harms human life and disturbs the function of different body organs including nervous, endocrine, immune, reproductive, renal, cardiovascular, and respiratory systems (Mostafalou & Abdollahi, 2013). The link between NCDs and pesticide exposure are established by many studies that include: Abdollahi et al. (2004); De Souza et al. (2011); and Mostafalou and Abdollahi (2012). Though pesticides are used to fight various pests and diseases but they are associated with both, acute and delayed health effects in exposed humans, ranging from simple skin and eye irritation to more severe chronic diseases, including cancer, parkinson, alzheimer, multiple sclerosis, diabetes, aging, cardiovascular and chronic kidney disease (Dhouib et al., 2016; Van Maele-Fabry, Gamet-Payrastre, & Lison, 2017). Occupational exposure to pesticides is associated with the development of cardiovascular disease among farm workers and increases the general risk of cancer (Burrows & Edwards, 2002; Alavanja, Ross, & Bonner, 2013; Sekhotha, Monyeki, & Sibuyi, 2016). Similarly, other than occupational exposure, indirect exposure via air drift, water, and intake through fruits and vegetables affect humans living near intensively managed agricultural areas and causes development of NCDs such as obesity, diabetes, thyroid diseases, cancers and especially hormonal-related cancers (Muir et al., 2004; Costa et al., 2014; Linhart et al., 2019).

In agricultural production, farmworkers are the population most exposed to pesticide (Wahab et al., 2016). Evidence suggests that many farmers are using some highly hazardous pesticides such as: carbosulfan, diazinon and carbofuran and a few banned pesticides like: heptachlor, endrin and DDT (Robinson et al., 2007; Zamir et al., 2009; Ali et al., 2014; Shammi et al., 2017). Awang and Colleagues (2011) found 72 percent of rice farmers experienced poisoning symptoms when handling pesticide. The most serious problems are associated with adverse health impacts of pesticides on child development. FAO (2004) shows retardation of intellectual development of children in rural India occurred due to intense use of pesticide. A randomized control trial in 18 villages of 6 states (by FAO) exhibited that the children of the control group demonstrated 87 per cent better development than their counterparts of the study group from the pesticide intensive areas. The World Bank revealed that the overuse of pesticides is widespread among vegetable farmers in Bangladesh, particularly bean and eggplant farmers (Dasgupta, Meisner, & Huq, 2005).

Overuse of pesticides, low level of knowledge and the lack of self-protective attitude happen to be the main reasons for high incidence rate of pesticide caused diseases (Adigun et al., 2010; Goldner et al., 2010). In Bangladesh, pesticide use is increasing due to intensive farming practices (Hasan et al., 2014; Meisner, 2004); where about 39% of 170 million population is directly involved in agricultural practices (World Bank, 2017). Due to such involvement exceptionally high rates of organophosphate insecticide poisoning is affecting 900 in every 100,000 people (World Bank, 2005). Evidence around the globe shows that, in Tanzania, high rates of improper pesticide practices were mostly due to farmers' low level of knowledge about pesticide toxicity (Ngowi et al., 2001). In India, farmers did not care about pesticide handling guidelines on container labels because they did not believe that pesticides were so toxic (Devi, 2009). In China, Fan et al. (2015) found that vegetables farmers' distrust of authorities and retailers and their own fear of profit loss were the main reasons for the inadequate protective behaviour. Thus, misconstrued perceptions (Hashemi & Damalas, 2010; Hashemi et al., 2012), as well as lack of knowledge (Lekei et al., 2014), disregard to or absence of regulation (Damalas and Hashemi, 2010; Khan, Mahmood, & Damalas, 2015) and education (Lekei et al., 2014) amongst farmers were described as some of the main causes for improper practices in pesticide application.

Vegetables are essential to healthy and nutritionally balanced diet. Ironically, these vegetables are produced with intensive pesticide use, particularly in developing countries (Li et al., 2014). In Bangladesh, over 60 kinds of local and exotic vegetable variety are cultivated on 470,414 ha of plantation land with a 2.8% yearly growth rate (BBS, 2010). Over the time, vegetable production in Bangladesh has been receiving policy incentives by the government. In 1974, pesticides were provided free to encourage market driven vegetable production from subsistence production. After 1974, about 50% of commonly used pesticides enjoyed a high subsidy until 2000

(Amin & Basu, 2004). Consequently, the country had experienced a sharp growth in use of pesticides -- for instance, from 7350 metric tons in 1992 to 45,172 metric tons in 2010 (Hasan et al., 2014; Meisner, 2004). A pesticide use survey conducted by the World Bank in Bangladesh found that around 50% of farmers used more pesticides than required to protect their crops and the intensity of pesticide use in vegetable cultivation was higher than that in other countries (The World Bank, 2007). Moreover, farmers often sprayed hazardous pesticides up to five or six times in one cropping season when only two applications were necessary (Baig et al., 2009).

Across such observations, specific to the context of Bangladesh, Akhter et al., (2018) studied the behaviors of vegetables growers in protecting themselves from exposure to pesticides where they found overuse and lack of safety precaution due to poor knowledge are serious threats to farmers health. Reports suggests during 1990 to 2010 there was a 244% increase in years of life lost (YLL) attributed to ischemic heart disease and a 133% increase in the YLLs from diabetes (IHME, 2013). A WHO and STEPS (2011) joint survey reveals high levels of risk factor prevalence with 99% of adults having at least one NCD risk (WHO, 2011). Nevertheless, there remain many unasked questions around the consequences of nonchalant attitude towards pesticide use in Bangladesh. We attempt to ask how such attitude, usually guided by knowledge and followed by practices—we combinedly use the popular term KAP (for knowledge, attitude and practice)—is contributing to deteriorate public health situation in terms of NCD.

Given such unique and alarming context, the scope of this paper goes beyond the study of knowledge, attitude, and practice (KAP) of vegetable growers. The core objective is to relate the KAP of pesticide users with their KAP towards NCDs. The 'result' section of the paper captures segregated data on this trilogy, i.e., knowledge, attitude and practice. The 'discussion and conclusion' section refers to the significance of health literacy in addressing NCD issues, mostly based on the result obtained through KAP study.

2.0 Materials and Methods

The study was the part of a larger intervention project namely, Reducing Dietary Risk Associated with Non-Communicable Diseases (RDRNCD). The intervention process essentially studied the population groups vulnerable to Non-Communicable Disease (NCD). RDRNCD aimed to obtain data about those at-risk population groups, which included rural farmers using pesticides to grow crops and vegetables. The project ensured their participation as the subjects of research, and directly engaged them not only in the research process but in interventional activities as well—avoiding separation between subject and object (Loewenson et al., 2011). However, this study relied only on sampling data at multiple stages with those farmer and grower households.

The RDRNCD project was implemented in 14 districts in Bangladesh. This study selected 6 out of those 14 districts. An indirect cluster sampling frame was used to select the sampling sites; with key selection criteria included: extensive presence of firming practices, intensive vegetables growing, and widespread use of pesticides. In order to obtain data on knowledge, attitude and practices (KAP) in relation to pesticide use and NCD subsamples were drawn from RDRNCD samples of those 6 districts (Table 2.1). The selection criteria to draw KAP sub-samples were age, number of years in farming practices, areas of land in vegetables production, user or sprayer of pesticide.

In order to determine sample size, the expected frequency was set to 50%, with 95% confidence interval and 5% margin of error. Thus, the sample size was found as 330. The study used *union* as the primary sampling unit (PSU). A *union* is the smallest geographic tier with precise and defined area in rural areas; each union consists of several villages. Though the smallest geographic unit happens to be a *mauza* or *ward* in Bangladesh, the study avoided considering these as because a *mauza* may be populated or depopulated and it can be devoid of vegetables cultivation or pesticide use. Thus, the study selected 16 unions following simple random sampling procedure.

Survey of this study characterized a multistage, geographically clustered, probability-based sampling of households. The questionnaire was administered by interviewers and no proxy interview was allowed. The sampling unit in each stage of selection refers to the entities that were selected for the survey. In this survey, the ultimate sampling units were the household and one individual residing within the selected household. Households (HH) in this survey was defined according to BBS (2011) as "a dwelling in which persons either related or unrelated living together and taking food from the same kitchen".

Sampling of eligible individuals was carried out from a sample of households - with one individual randomly selected per household. The KAP field survey choose a minimum of 10 and maximum of 30 households/farmers from each *union* to obtain the optimum representative samples. A standardized questionnaire was used to interview the farmers about their knowledge, attitudes and practices related to pesticide use as well as occurrence of NCD. All interviews were administered verbally in Bengali and the responses were written on the questionnaire by the enumerators. Thus, to obtain KAP samples, the study conveniently selected these 6 districts (Fig 2.1) from the larger RDRNCD intervention areas.

Table 2.1 District-wise number of respondents

District	*Unions* covered	HH (RDRNCD)	HH (KAP)
Sherpur	2	389	49
Jamalpur	2	390	74
Pabna	2	394	22
Khulna	2	390	45
Satkhira	4	780	102
Munshiganj	4	780	42
Total	16	3123	**334**

The survey questionnaire was pre-tested by interviewing 10 farmers in a different district (Sylhet) who were not included in the actual study. Feedbacks from the pre-testing were considered to ensure further clarity and appropriateness by editing the questionnaire accordingly. A standardized code plan was used by the interviewers to code the Bengali answers for data entry in English.

3.0 Results

The survey questionnaire was designed based on the three KAP components, i.e., knowledge, attitude and practice in relation to pesticide use in vegetables production. The questions under each component dealt with a distinct and specific aspect (which we call criterion in our findings). Thus, 5 criteria were explored with same number of (5) questions to understand status of 'knowledge' about pesticide use. Similarly, 5 'attitude' and 6 'behavior' related criteria were explored. As well, this section captured data related to knowledge and awareness of studied vegetables grower population on NCD occurrence due to pesticide exposure.

3.1 Knowledge about pesticide use

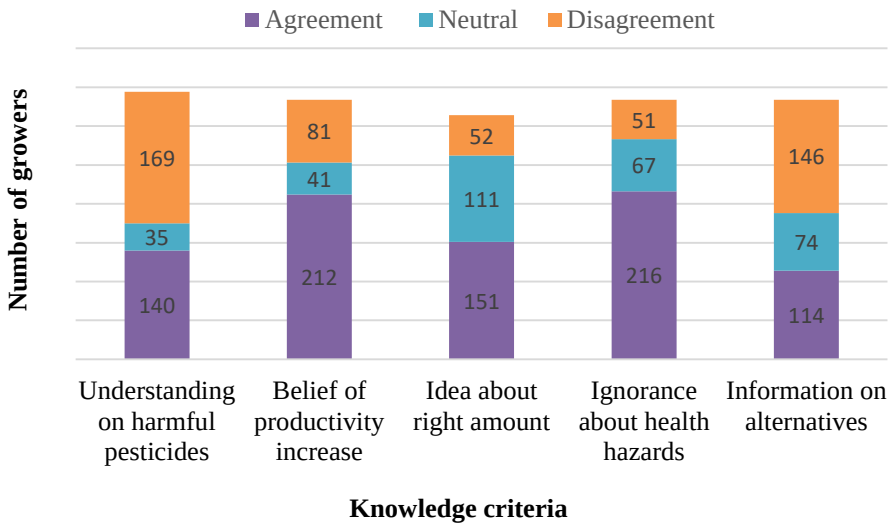
The following aspects (Table 3.1) were explored to understand knowledge level of vegetable growers and farmers about pesticide and their use:

Table 3.1 Inquiry statement to explore knowledge related aspects

Inquiries
I can read and understand which chemical pesticide is harmful for health
I am certain that pesticides lead to more production of vegetables
I know about right amount of pesticide to be applied to a given vegetable field
There is no health problem with consumption of pesticides applied vegetables
I know other alternative to pesticide to grow vegetables

These inquiry statements enabled the study to gather the status of knowledge of growers on several criteria, such as: understanding, belief, idea, ignorance, and information richness in relation to pesticide use. The following figure (Figure 3.1) exhibits the extent of agreement, disagreement and indecisiveness (neutral) of the respondents based on these criteria.

Fig 3.1 Status of Knowledge about pesticide use (N=334)



We found that the understanding on harmful chemical identification among the respondents is quite alarming. More than half of the growers did not know which pesticide causes harm to their health. About 70% believe that pesticide use is a must for high productivity of vegetables while less than 50% of them know about the right mix and quantity of pesticide that should be applied to their vegetable fields or gardens. Again, about 70% respondents are ignorant about the health problems caused by consumptions of pesticide applied vegetables. Interestingly, despite being users of chemical pesticides, about one-third of the respondents have knowledge about the alternative pest control mechanisms.

3.2 Attitude on pesticide use

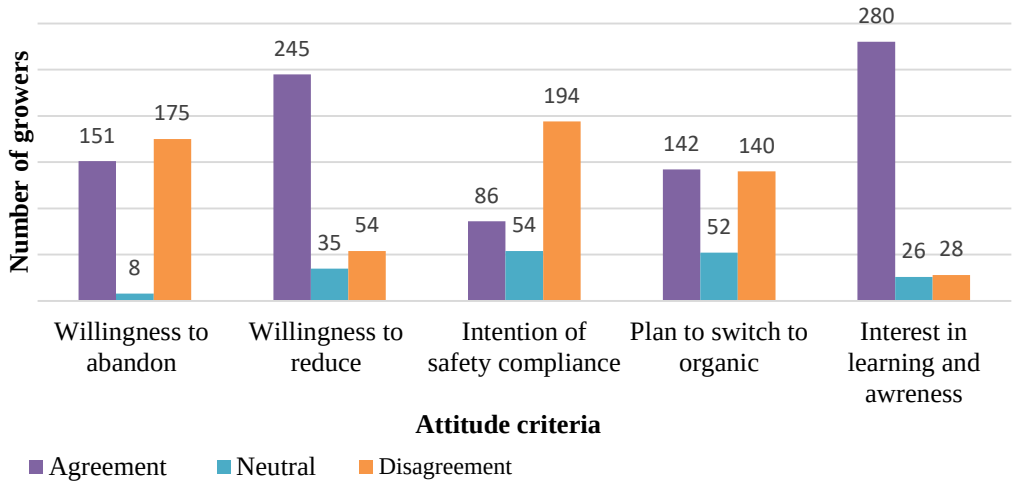
The following inquiries (Table 3.2) were made to understand the attitude of vegetable growers and farmers about pesticide use:

Table 3.2 Inquiries to explore attitude related aspects

Inquiries
It is possible for me to grow vegetables without pesticides (i.e., abandoning it)
I should use less pesticides in future
I want to follow right and safe procedures of using pesticides
I would like to use organic pesticides instead of chemical ones
I am interested to learn from television and radio programs regarding pesticide use

With these set of inquiries, the study delved out several attitude related criteria of the growers such as: their willingness to abandon pesticide use; phase out gradually; complying to safer methods of application; adopting to organic pesticides; and interest in learning and awareness. The following figure (Fig 3.2) comprehends the findings on these attitude related criteria.

Fig 3.2 Attitudes on pesticide use (N=334)



It is evident that more than half of the respondents were not willing to abandon pesticides use as they thought it is not possible to produce vegetables without their application. A vast majority of respondents (73%), however, thought that they should reduce the extent and quantity of pesticide use. As regards compliance to safety procedure, only about 26% of the respondents were intending to switch to safer mode of application while 16% were indecisive – leaving 58% still intending to go with 'business as usual'. The number of respondents those who were willing to adopt to organic pesticides in future and those who were not – are almost equal. Optimistically, almost all the respondents (about 84%) expressed their interests in learning about pesticide use and to be aware of these through mass media, e.g., radio and television programs.

3.3 Practice of pesticide use

Six inquiry statements were included in the questionnaire to find out the practices pertaining to pesticide use by the vegetable growers. The statements are listed as follows (Table 3.3):

Table 3.3 Inquiries to understand practices

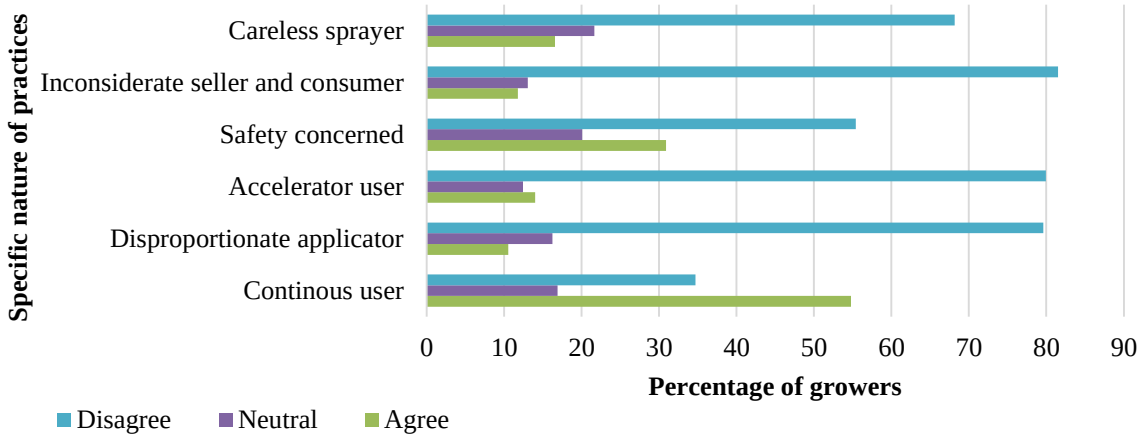
Inquiries
I consider air direction, keep kids and family members away while applying pesticides
I sell or eat vegetables immediately or within short period after pesticide applications
I cover my face and hands while using pesticides
I have increased the frequency of pesticide application in my field more than last year
I heard about ideal amount that should be used but I apply more than that quantity
As a pre-caution, I always use pesticides for vegetable production and will continue to do so irrespective of pest attack

These six inquiries tried to encapsulate specific nature of practices in relation to the use, especially application of pesticides. First, we tried to know how careful the growers are while applying the pesticide in the field or garden. It is found that only 16% of the growers are adequately careful and take necessary precaution while spraying pesticides, and about 68% of them are not careful enough.

Second inquiry dealt with their selling and consumption behavior after applying the pesticides, i.e., whether they are considerate to save their or other people's heaths from probable harmful effects of freshly spread pesticides.

It is found that 82% of them abstain themselves applying pesticides right before selling or consuming vegetables. Third, in the question of own safety, 56% of the respondent informed that they do not cover themselves with necessary safety gears. Fourth inquiry was meant to find out growers who accelerating the use of pesticides. We found 14% of them increased number of applications over the previous year. Fifth practice related inquiry tried to find whether the growers apply the standard proportion of pesticides. It is found that about 10% of them go for more quantity and 16% are not sure about the proportion of their mix. Last inquiry had idea about the continuation of such practice, where 55% of the growers intended that they will continue using pesticides as a pre-caution from pest attack. The following chart (Figure 3.3) categorized the specific nature of practice and percentage of growers agreeing, disagreeing or neutral in response to such practice.

Fig 3.3 Practice criteria and percent of growers (N=334)

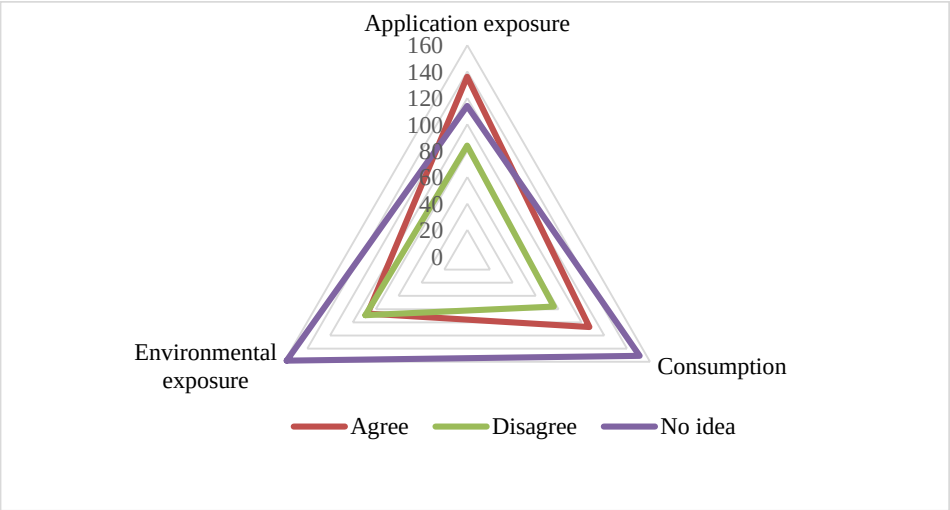


3.4 Knowledge and awareness on pesticide-NCD relation

The respondents were briefed about NCDs such as cardiovascular diseases, cancers, respiratory diseases and diabetes. They were asked: i) whether direct exposure to pesticides through application, i.e., handling and spray could be a reason to develop such NCDs in the long run. About 40% of the growers are aware that such pesticides handling is harmful and can cause NCDs as mentioned. ii) On the question of pesticides laden vegetables consumption, 32% reported that they understand such NCDs can occur to them due to consumption of pesticides applied unsafe vegetables. iii) As regards, environmental exposure 26% thought that their children family member or other people living within or nearby the pesticide applied area can develop such NCDs. Figure 3.4 captured responses on an awareness radar based on these results.

The notable aspect unraveled here is that most respondents are not aware that exposure to pesticides through handling, air, water, or consumption might cause NCDs to them. The following figure (Figure 3.4) reveals that the radar representing non-awareness and poor knowledge is much wider than those agree or disagree with the questions concerning three key reasons of pesticide-NCD linkages. Therefore, a vast majority of the respondents have ‘no idea’ whether the NCD occurrence has any linkage at all with exposure to pesticides. Again, a significant portion of the respondents do not believe (‘disagree’) that pesticide exposure can cause NCDs in the long run.

Figure 3.4 Knowledge and awareness radar on pesticide exposures and NCD linkage



4.0 Discussions and Conclusions

While pesticides are regarded as the solution to farmers' pest concerns, our attempt was to understand about the health concerns associated with these. Our presumption was that the literature dealing with pesticide related health issues not sufficiently exploring as to why such concerns becoming major public health threats, and how these should be redressed. It is indeed a complex task to determine health consequences to specific low-level, long-term exposure to the vast array of pesticides used by farmers and vegetables growers. There are arguments that many pesticides are beneficial for farmers as well as environment (see for example: Cooper & Dobson, 2007). Nevertheless, negative effects of pesticide residues, agricultural safety and the resulting environmental and health problems from pesticide application are acknowledged widely in literature and increasingly considered as the threat to public health (Dinham & Malik, 2003; Leyk, Binder, & Nuckols, 2009). This threat exacerbates when people possess a poor level of health literacy regarding the impact of pesticide, i.e. the diseases (non-communicable) they can cause to them in the long run.

Our study focused on the reasons as to why pesticide induced health issues are latent threats; and then unraveled the fact that the overall health literacy of the pesticide users is in a questionable state. It is evident from the results of this study that the knowledge, attitude, practice, and awareness of the vegetable growers in relation to use and exposure to pesticide vis a vis potential health hazard are poor in many respects. Pesticides users' ability to read and identify the harmful chemicals and understanding on the appropriate application procedure are crucial. The level of knowledge of pesticide usage of the farmers is vital for providing sound strategies to reduce environmental and human health risks. Educated farmers or growers are able to read and understand the

pesticide labels and apply the products correctly, while less educated ones fail to follow the prescribed guidelines (Ibitayo, 2006; Recena et al., 2006). Lack of education has been associated with poisonings, exposure risks, and high mortality rates in many rural areas of developing countries (Remoundou et al., 2014; Mokhele, 2011; Zyoud et al., 2010).

Majority of the farmers and growers in this study were found unable to read the prescribed guidelines and understand harmful effect. In addition, a large percentage of them has no idea about the right mix or proportions that should be applied to a given field. Such ignorance is further aggravated as most of them (about two-third) are not aware of the harmless or organic alternative solution to the pesticides. The knowledge of the growers is indeed intertwined with and sourced from their perceptions and belief about pesticides. Most vegetables growers (about 70%) of our study had pre-conceived notion that pesticides help increasing the productivity. As well, they thought there is no problem in consuming pesticides laden vegetables. We consider such poor state of knowledge and perceptions of the growers are conducive to surfacing pesticide induced diseases in future. To redress such situation, i.e., to mitigate potential risks of pesticide induced diseases, adequate education, training, and awareness for growers or farmers are required.

Enhancing knowledge through education and training might not be enough to mitigate the potential pesticide related disease risks (Feola, Gallati, & Binder, 2012). There are studies that reported farmworkers possessing adequate knowledge of pesticide-related symptoms but still engaged in risky practices (Darçin & Darçin, 2017; Kachaiyaphum et al., 2010; Kim et al., 2017; Recena et al., 2006; Yassin et al., 2002). Among the studied growers, we observed majority of them are not willing to abandon pesticide use at all, and they think that they are following the right application procedure. Complacency and audaciousness have engulfed their attitude after many years of similar practice (Damalas, Theodorou, & Georgiou, 2006). We suggest, there needs to be an attitude change and renewed mindset among the growers about the pesticides and their effects. However, a large percentage are willing to reduce the quantity applied (over the previous year), switch to alternative organic and harmless mode, and learn about pesticide use -- indicating that awareness related intervention would be appropriate to shape up or enhance the attitude of the growers.

Poor knowledge and inappropriate attitude result in improper practice—in the form of increased pesticide usage in terms of frequency and dosages, yields a lower crop protection and increased the human and environmental loads. There are evidences that suggest that farmers perception of their abilities to tolerate pesticide risk after several exposures also resulted in poor practices with pesticide application (Arcury, Quandt, & Russel, 2002; Cabrera & Leckie, 2009; Kim et al., 2017). Elderly farmers with number of years of experience ignore protective practices most (Levesque et al., 2012). As our study revealed, most growers were utterly careless as they neither considered air direction or cared what they uptake through air while spraying the pesticides, nor they were cautious about exposures of their family members to the pesticides. Such carelessness obviously led most of them not to be wearing protective gears—an unsafe practice in pesticide application. Again, such unconcerned behavior led to unethical practices as we found most of them sell these to market immediately after application of pesticides. In terms of incremental use rate, we found most of them as ‘accelerator’ of pesticides in the environment; and they could be termed as ‘disproportionate applicator’ due to their indiscriminate and out of proportion mixing practices in application of pesticides.

As our study was not poised to determine the occurrence of non-communicable diseases (NCDs) among the respondents rather attempted to have an overview by studying their knowledge – as potential victim or subject (people exposed to pesticide) vis a vis the objects (NCDs). The studied population though aware of NCDs but their ideas were limited -- about how exposure to pesticides can make them vulnerable to such diseases. It is already know by many scientific studies that pesticides are associated with both, acute and delayed health effects in exposed humans (Dhouib et al., 2016), especially occupational exposure to pesticides is associated with the development of a wide spectrum of NCDs and long term non-occupational exposure results the same (Gangemi et al, 2016; Shekhota, Moneyeki, & Shukhemi, 2016). In the face of such potential health calamity, we find the poor knowledge, nonchalant attitude and inappropriate practice of pesticide users will

certainly exacerbate the NCD situation in Bangladesh. Meanwhile, Bangladesh being one of the implementer of UN sustainable development goals (SDGs) needs to reduce the high toll of NCD deaths as part of SDG 2030 target Tackling NCDs through the reduction of exposure to hazardous environmental and occupational risks is essential to achieving the SDGs, notably, SDG 3 on health and, in parallel, to address SDG 7 on energy, SDG 8 on decent work and economic growth, and SDG 12 on consumption and production and, thereby, chemicals and wastes.

In conclusions, health literacy on NCDs among the pesticide users in Bangladesh is in an alarming state as evident from the study of knowledge, attitude and practice (KAP) on use of pesticide in vegetable production. Our study indicates that the knowledge and awareness of the farmers about the relation between pesticides use and potential occurrence of NCDs need to be enhanced. However, mere knowledge related intervention might not be enough to redress the situation as the attitude and practices of the vegetable growers or producers are ingrained in their long-held beliefs and perceptions. Consolidated and concerted efforts will require in policy interventions in terms of raising awareness through training and educations to the primary users and applicators of the pesticides. Given the present status of KAP, we understand that pesticides with potential toxicity to human health will continue to be used by them as ensuring productivity for food security is more important concerns to the producers as well to the country itself – being an overpopulated and poverty ridden nation. Therefore, different stakeholders in the agricultural, developmental, and governmental sectors must play a significant role to curb and decrease the pesticide induced NCD condition in order to enhance future public health in Bangladesh. Further research on community-based intervention to promote safe pesticide use or promotion of organic pesticide could be considered in this respect.

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