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RESEARCH ARTICLE

PREVALENCE OF RISK FACTORS OF MAJOR NON-COMMUNICABLE DISEASES
AMONG ADULT POPULATION OF KASHMIR VALLEY

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ABSTRACT

Background: Burden of non communicable diseases is rising at current and has led to epidemic proportions in most of the developing countries like India. There is a growing concern regarding these diseases as they do not have a specific or single cause which is easily amenable to control activities. But, the multiple factors causing these diseases are lifestyle related which can be easily limited or controlled with simple approaches of promotive and preventive services aimed at population levels. The objectives of the study were to estimate the prevalence of risk factors of major non communicable diseases among adult population (18 years and above) of Kashmir valley and to find out the socio demographic pattern of these risk factors.

Methodology: Sample size was derived by the formula $n = z^2pq/e^2$. Sample was selected by multistage technique. The questionnaire included three parts, background characteristics of participants, history of diabetes and high blood pressure, body measurements including blood pressure measurement. Data was analysed using appropriate statistical software. Results were expressed in proportions.

Results: The percentage of tobacco users was 31.08%, low physical activity in 28.4%, over-weight 30.67% obese 8.50%, diagnosed diabetes mellitus was 1.66%. The percentage of respondents with waist to height ratio of greater than 0.5 was 30.25%. The prevalence of hypertension was 17.50%.

Conclusion: This study found a high burden of risk factors of non-communicable diseases with 1 in 4 of the study participants smoking, engaged in low physical activity. 1 in 5 hypertensive, 2 in 5 overweight or obese, 1 in 3 (approximately) having higher waist to height ratio.

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INTRODUCTION

One of the globally pervasive change has been the rising burden of non communicable diseases (NCD's). NCD's epidemics are presently evolving /coming to fore or accelerating in most low and middle income countries. (Miranda et al., 2008) Even though, communicable diseases are receding to some extent as leading contributors to mortality and morbidity but cardiovascular diseases, cancers, diabetes are presently major contributors to death and disability. Projection by World Health Organization (WHO) is that by the end of 2015 NCD's will account for over 70% of all deaths globally with 80% of these will occur in developing countries like our own country India. (WHO, 2005) Majority of non communicable diseases have some of the common risk factors which include tobacco use, diet low in fruits and vegetables,

physical inactivity, overweight/obesity. The burden of these diseases in a population is directly dependent to the burden of its risk factors so preventing these risk factors will indirectly prevent non-communicable diseases. Primary prevention is regarded as one of the most cost-effective, affordable and sustainable action to cope with the chronic diseases epidemic worldwide. At present no community based literature is available till date in Kashmir valley which has been conducted or published on so many risk factors of non communicable diseases in three districts and using the WHO Stepwise approach. (Bonita et al., 2002) This study will provide useful information to program managers at state and national level so that a prompt planning of preventive, promotive actions are being taken off to decrease the community burden of NCD risk factors in India in general, and, in Kashmir valley in particular.

Objectives

1. To estimate the prevalence of risk factors of major non communicable diseases in population of 18 years and above in Kashmir valley.

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2. To find out the socio demographic pattern of these risk factors.

MATERIALS AND METHODS

A Community based cross-sectional study was conducted among Kashmiri population (18 years and above) from March 2012 to March 2013. The sample size was calculated using the formula, $N = (Z^2 pq / e^2) \times \text{design effect}$. Considering the prevalence (p) of 8% of one of the risk factors from a previous study, margin of error (e) 2%, design effect (1.5) and non response rate of 10%. The sample size came out to be 1200. (IDSP-NCD, 200)

Sampling Technique

Kashmir valley is arbitrarily divided into three zones north, south and central.

The sample was taken from Kashmir valley by multistage random sampling.

- **Stage 1:** From each zone one district was selected randomly (Anantnag, Srinagar, Ganderbal)
- **Stage 2:** From each selected district 20% of health blocks were taken randomly. (Mattan, Hazratbal, Ganderbal).
- **Stage 3:** From each selected health block 10% of the subcenters were selected randomly. (Akura, Nandpora, Khulmulla)
- **Stage 4:** From each selected subcenter, 30% of villages/mohallas were selected as per probability proportional to size of the population (PPS). The total sample was divided among the 9 villages with a sample of 533 individuals from Anantnag district, 340 studied from Srinagar district and 267 from Ganderbal district. The data was collected according to WHO Stepwise approach to Surveillance of risk factors for non communicable diseases.

Step 1 (Self report): Information on Socio-demographic variables (age, education, type of family, marital status, income). Socioeconomic status was assessed as per B.G Prasad's scale 2013. Behavioural risk factors like tobacco use, diet, physical activity and hypertension were collected by using a pre-tested structured interview schedule after taking a proper consent.

Step 2 (Physical examination); Blood Pressure, Height, Weight, Waist circumference were taken with standard instruments and protocols.

Weight was measured on a pre-calibrated weighing scale (bathroom scale). The scales were calibrated daily using a standard weight. Measurements were taken to the nearest 0.1 kg. Participants were weighed in light clothing and barefeet. Height was measured in the Frankfort plane with a portable stadiometer. The measurements were taken to the nearest 0.1 cm. Waist circumference was taken by using a non stretchable tape. Waist circumference was measured at the midpoint between the lower margin of last rib and the iliac crest to the nearest 0.5cm. Blood Pressure was measured with a properly calibrated and validated blood pressure measuring

instrument on the right upper arm in sitting position, after a rest of at least 5 minutes. Two measurements were taken with an appropriate sized cuff and the mean of the two readings was used for analyses. (The seventh report of the joint National Committee on Prevention, Detection, 2003) The study was approved by the ethical board of Government medical college Srinagar. The data was entered in Microsoft excel (2007) and analysed using appropriate statistical software. Frequencies were obtained using descriptive statistics. Test of proportions (chi-square) was used. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Participant characteristics, data on the behavioural risk factors are presented in Tables 1 and 2. Other risk factors (anthropometric) are listed in Table III. The sociodemographic pattern of different risk factors is listed in Table 4.

Table 1. Participant characteristics; Socio-demographic

Variables	Sample (n)	%
Age (years) <= 20	128	10.67
21-30	312	26.00
31-40	333	27.75
41-50	170	14.17
51-60	177	14.75
>60	80	6.67
Sex		
males	405	33.75
females	795	66.25
Education		
<10yr of schooling	827	68.92
>= 10yr of schooling	373	31.08
Occupation		
homemakers		
Skilled/unskilled service class	526	43.84
Farmers	216	18.00
Students	190	15.83
	63	5.25
	205	17.08
Socioeconomic status		
Classi	192	16.00
Class iv	326	27.17

Table 2. Behavioural characteristics of the study participants

Variables	Sample(n)	%
Tobacco use		
users	373	31.08
non-users	827	68.92
Diet		
fruit <=4days/week	1074	89.50
vegetable<=5 days/week	936	78.00
Physical activity		
low activity	341	28.41
History of diabetes mellitus	20	1.66

Table 3. Anthropometric risk factors

Hypertension	N=210	17.5%
overweight/ obese	N=368/102	30.67%/8.5%
waist to height ratio>0.5	N=363	30.25%

DISCUSSION

Considering the fact that major NCD's like Ischemic heart diseases, lower respiratory diseases, stroke, diabetes represent

an important public health challenge and that the morbidity and mortality associated with them is expected to increase further in coming future, this study was undertaken with the aim of assessing the magnitude of their shared risk factors which can guide us in taking appropriate interventions aimed at the general population so that the burden associated with these NCD's can be effectively dealt with.

Only 22 % took vegetables for >5 days a week. [Usman et al](#) reported a high prevalence of low fruit and low vegetable in Eritrea at 84.7% and 50.6% respectively. ([Usman et al., 2006](#)) [Thankappan et al. \(2010\)](#) in a study in Kerala reported diet low in fruits and vegetables to be 40% ([Thankappan et al., 2010](#)).

Table 4. Sociodemographic pattern of different risk factors

Risk factors	Sex (male/female) (%)	Occupation service class /unskilled (%)	Education (>10 year/<10 year)	Socioeconomic status (%) (classi/classiv)
tobacco use	57.28 /12.08*	52.66/16.73*	29.74/18.03	23.96/50.0
fruit consumption (>4 days/week)	16.29/7.54*	26.61/6.38	30.77/2.57	33.85/2.96*
vegetable consumption (>5 days/week)	26.91/19.50	32.26/25.53	30.77/15.9	33.85/22.70
physical activity(high) (low)	36.79/7.67	29.03/72.34	46.15/13.98	22.39/25
history of diabetes	0.98/49.93	11.29/0.00	23.07/31.67	25.56/11.05
hypertension	1.48/1.76	4.03/0.00	1.6/1.7	4.17/0.31
overweight/obese	16.05/18.24	16.13/8.51	7.69/28.94	14.58/25.00
waist to height ratio >0.5	26.42/45.66*	54.84/8.51	29.51/45.82*	55.21/33.13
	13.58/38.74*	29.84/2.13	50.0/36.98*	37.5/19.94

Chi square test * p=<.001

Compared with non smokers, smokers have been found to have increased risk of

- Developing lung cancer by 23 times (males) and by 13 times (women), Coronary heart disease by 2 to 4 times. ([The Health Consequences of Smoking, 2004](#); [Reducing the Health Consequences of Smoking, 2013](#))
- Dying from chronic obstructive lung diseases (such as chronic bronchitis and emphysema) by 12 to 13 times. ([The Health Consequences of Smoking, 2004](#))
- Stroke by 2 to 4 times. ([The Health Consequences of Smoking, 2004](#); [Ockene and Miller, 1997](#))

The prevalence of smoking in the present study was 31.08%. It was comparable to a STEPS study conducted by [Sophal et al. \(2010\)](#) in Cambodia in which it was 29.4%. [Oum Sophal and Dr. Prak Piseth Raingsey, 2010](#) Three times as that observed in the state of Maharashtra (9%) in NCD risk factors survey (2009) done in India. (IDSP-NCD Risk factor Survey. Factsheet-India)

Fruits and vegetables are the cornerstones of a healthy diet. They are rich in vitamins, minerals, complex carbohydrates and fiber containing no cholesterol, fat, and low in calories. A high intake of vegetables particularly of the Brassica family can sharply reduce the risk of cancer. ([Truswell 1999](#)) Vegetables have been found to have compounds which help in detoxification and clear potential carcinogens. In addition to this fruits and vegetables are rich sources of Beta-Carotene and vitamin-C which may also protect against cancer and heart disease. ([Steinmetz et al., 1996](#); [Diaz et al., 1997](#)) The risk of vegetarians suffering a heart attack is around two-thirds lower than that of meat-eaters. ([Rottka, 1994](#)) Studies have found that diets containing vegetables reduce the risk of cancer-particularly lung, ovarian, and breast cancer by up to 50%. ([Trock et al., 1990](#)) This study observed a high proportion of respondents consuming inadequate amount of fruits and vegetables. About 28.67% of the participants reported only once or none fruit intake in a week.

In a similar study done in India greater than 70 % of the respondents across 7 states consumed less than 5 servings of fruit and vegetables per day. (IDSP-NCD Risk factor Survey. Factsheet-India. Phase –I States) The reason for this insufficient fruit and vegetable intake in valley can be due to seasonal variations, as, Kashmir has harsh and long winters when most of the people here donot get enough fresh fruits and vegetables. It may also be due to the fact that Kashmiri people prefer meat products over vegetables.

Physical inactivity leads to higher morbidity from cardiovascular disease, ischemic stroke, metabolic syndrome, cancer, non-insulin dependent diabetes mellitus, osteoporosis, and mental health. ([Eckel et al., 2005](#)) The prevalence of low physical activity was 28.4%. A similar study conducted in Nigeria by [Okpechi et al. \(2013\)](#) reported 64.2%. ([Okpechi et al., 2013](#)) NCD risk factors survey in Madhya Pradesh found the prevalence to be 42%. (IDSP-NCD Risk factor Survey. Factsheet-India. Phase –I States)

The high prevalence of physical inactivity may be because of easy availability of public, as well as personal transportation, improved socioeconomic status.

Obesity has been associated with numerous co morbidities, including hypertension (HTN), type II diabetes mellitus, dyslipidemia, certain cancers, and major cardiovascular diseases. ([Carl J Lavie et al., 2009](#)) WHO has recommended classifications of body weight which include gradations of excess weight or over weight that are associated with increased risk of non-communicable diseases. (WHO, 1995; WHO, 1997) These classifications are based on BMI. Current study found the prevalence of overweight or obese as 39.17%. [Okpechi et al.](#) found overall overweight/obese to be 33.7%. ([Okpechi et al., 2013](#))

In 2004, WHO expert consultation concluded that Asians generally have a higher percentage of body fat than white population of the same age, sex, and BMI. Also, the

proportion of Asian people with risk factors for type 2 diabetes and cardiovascular disease is substantial even below the existing WHO BMI cut-off point of 25kg/m². (WHO expert consultation, 2004) If taken WHO cut-off point for Asian population in to consideration then the prevalence of BMI between 23-27.5 is 34.83% and ≥ 27.5 is 20.25% increasing further the burden of overweight/obesity.

The possible reasons for such a high level of prevalence in Kashmir may be due to improvement in socio-economic status, sedentary lifestyle, better food availability (increasing proportion of nutrition obtained through consumption of fats and proteins).

In a systematic review and meta-analysis done by Ashwell *et al.* (2012) of 31 studies, they concluded that Waist to height ratio should be considered as a better screening tool for cardio metabolic risk than BMI and waist circumference alone. (Ashwell *et al.*, 2013; Savva *et al.*, 2013) Browning *et al.* (2010) did a systematic review of 78 studies exploring waist to height ratio (WHtR) and waist circumference or BMI as predictors of diabetes and CVD. They too reported waist to height ratio as a more useful global screening tool and 0.5 to be considered as suitable global boundary value. (Browning *et al.*, 2010) Keeping above in view, this study found a prevalence of 30.25% (>0.5 Waist to height ratio). So, it is clear that, our population is not far away from adverse cardio metabolic outcomes.

The relationship between BP and risk of CVD events is continuous, consistent, and independent of other risk factors. The higher the BP, the greater is the chance of heart attack, heart failure, stroke, and kidney disease. For individuals 40–70 years of age, each increment of 20 mmHg in systolic BP (SBP) or 10 mmHg in diastolic BP (DBP) doubles the risk of CVD across the entire BP range from 115/75 to 185/115 mmHg. (Lewington *et al.*, 2002)

High blood pressure was observed in 17.50% of individuals evaluated. It is comparable to many studies. The prevalence of hypertension in the general population was 16% in a study conducted by Usman *et al.* in Eritrea. (Usman *et al.*, 2006) Bharadwaj *et al.* reported prevalence of 15% in Nagpur. (Bhardwaj *et al.*, 2012) Raina *et al.* (2009) in a study in Jammu reported prevalence of hypertension to be 13%. (Raina and Jamwal, 2009)

The possible reason for such a high prevalence of hypertension may be due to high salt intake in the form of noon chai (salt tea) in Kashmiri population, lack of exercise, stress due to political turmoil prevailing in valley.

Diabetes is known as a “silent disease,” as no symptoms occur until it progresses to severe target organ damage. (Rema *et al.*, 2000) Diabetes gives rise to risk of microvascular damage (retinopathy, nephropathy and neuropathy). Macrovascular complications in the form of ischaemic heart disease, stroke and peripheral vascular disease. The prevalence of diagnosed diabetes found in the present study was 1.66%. Usman *et al.* reported a prevalence of 2.2% in Eritrea. (Usman *et al.*, 2006)

Whereas the national NCD risk factor Survey reported a prevalence of diagnosed diabetes ranging with a low of 0.7% in Mizoram to a high of 6.4% in Kerala. (IDSP-NCD Risk factor Survey. Factsheet-India. Phase –I States) In this study the risk factors for major NCD's were gender related with tobacco smoking more frequent in males whereas physical inactivity, diabetes, overweight/obese, hypertension more frequent in females. Increasing pattern of smoking, diabetes, hypertension, overweight/obese, with increasing age group of the respondents. The prevalence of smoking, physical inactivity, hypertension was high in lower levels of education whereas, diabetes and overweight/obese was high in higher levels of education. The prevalence of smoking, insufficient fruit and vegetable intake, and hypertension was high in occupation levels of manual work like labourers, homemakers and farmers whereas overweight/obese was more frequent in service class. Smoking, diabetes and hypertension was more prevalent in divorced/widowed. Physical inactivity, diabetes, overweight/obese, was high in upper socioeconomic classes.

The socio demographic pattern of risk factors in this study is almost comparable with NCD risk factor survey conducted in India which reported prevalence of tobacco use lower in female population as compared with males in all the states except Mizoram. A declining pattern of prevalence was observed with increasing level of education. Prevalence of tobacco use among the occupation of agriculture and manual worker was high compare with others. High proportion of population was taking inadequate amount of fruits and vegetables. Its distribution among various levels of education, occupation was found very high with some marginal differences. Besides that, more than half of the population was found in the category of low physical activity in all the states except Madhya Pradesh. More female respondents were in the category of low physical activity as compare with males across all the age groups. The increasing pattern of prevalence of hypertension was recorded with increasing age of people. It was prevalent in all education levels and occupational categories. High prevalence of overweight was recorded in all the age groups except the younger age. Low prevalence of overweight was recorded among illiterates as well as among the people working in agriculture or manual worker. (IDSP-NCD Risk factor Survey. Factsheet-India. Phase –I States)

Conclusion

The findings of the present study reveal that Kashmir valley is presently in the middle of this epidemiologic transition where we have to fight the double burden of infectious or communicable diseases and non communicable diseases hand in hand. Early interventions at this point of time is needed to save the general population from these incurable diseases.

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Author's contribution: Dr. Mehbooba conceived the study, collected the data and prepared the manuscript. Dr Iftikhar, Dr

Sufoora, Dr S.M.Salim Khan, Dr Iqbal reviewed the article. Dr. Inam helped in data entry and statistical analyses.

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REFERENCES

- Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. WHO expert consultation. *Lancet*, 2004; 363:157-63.
- Ashwell M, Gunn P, Gibson S. Waist to height ratio is a better screening tool than waist circumference and BMI for adult cardiometabolic risk factors: systematic review and meta-analysis. *Obes Rev.*, 2013 Mar;13(3): 275-86.
- Bhardwaj SD, MK Shewte, PR Bhatkule, JR Khadse. Prevalence of risk factors for non communicable diseases in a rural area of Nagpur district, Maharashtra-A WHO STEPwise approach. *Int J Biol Med Res.*, 2012;3(1):1413
- Bonita R, DeCourten M, Dwyer T, Jamrozik K, Winkelmann R. Surveillance of risk factors for noncommunicable diseases: The WHO STEP wise approach. Geneva, Switzerland: World Health Organization; 2002
- Browning LM, Hsieh SD, Ashwell MA. systematic review of waist-to-height ratio as a screening tool for the prediction of cardiovascular disease and diabetes: 0.5 could be a suitable global boundary value. *Nutr Res Rev.*, 2010 Dec;23(2):247-69.
- Carl J Lavie, Richard V Milani, Hector O Ventura. Obesity and Cardiovascular Disease Risk Factor, Paradox, and Impact of Weight Loss. *J Am Coll Cardiol.*, 2009; 53(21): 1925- 1932
- Diaz MN, *et al.* Antioxidants and atherosclerotic heart disease. *N Engl J Med.*, 1997;337:408.
- Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. *Lancet*, 2005; 365: 1415–28.
- IDSP-NCD Risk factor Survey. Factsheet-India. Phase –I States
- Lewington S, Clarke R, Qizilbash N, *et al.* Age-specific relevance of usual blood pressure to vascular mortality: A meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet*, 2002;360:1903-13.
- Miranda JJ , Kinra S, Casas JP, Davey Smith G, Ebrahim S. Non Communicable diseases in low and middle income countries context, determinants and health policy. *Trop. Med. Int Health*, 2008; 13:1225-34.
- Ockene IS, Miller NH. Cigarette Smoking, Cardiovascular Disease, and Stroke: A Statement for Healthcare Professionals from the American Heart Association. *Circulation* 1997; 96(9):3243–7
- Okpechi IG, Chukwuonye II, Tiffin N, Madukwe OO Onyeonoro UU Umeizudike TI, Ogah OS. Blood Pressure Gradients and Cardiovascular Risk Factors in Urban and Rural Populations in Abia State South Eastern Nigeria Using the WHO STEP wise Approach. *PLoS One*. 2013 Sep 5;8(9)
- Oum Sophal, Dr. Prak Piseth Raingsey, 2010. Non-Communicable Diseases Prevalence and risk factors in Cambodia. Ministry of Health. Cambodia
- Raina D. J, D. S Jamwal. Prevalence study of overweight / obesity and hypertension among rural adults. *Jk sciences* 2009 January – March ; 11 : 1.
- Reducing the Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General : U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control. National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1989 [accessed 2013 June 28].
- Rema M, Deepa R, Mohan V. Prevalence of retinopathy at 93. Diagnosis among Type 2 diabetic patients attending a diabetic centre in South India. *Br J Ophthalmol.*, 2000; 84 : 1058-60
- Rottka H. Vegetarianism-Pro and Con: The berlin Vegetarian Study. In: Kluthe R. Kasper H, eds. *Fleisch in der Ernährung*. Stuttgart: Georg Thieme Verlag; 1994
- Savva SC, Lamnisos D, Kafatos AG. Predicting cardiometabolic risk: waist-to-height ratio or BMI. A meta-analysis. *Diabetes Metab Syndr Obes.*, 2013 Oct 24;6:403-419
- Steinmetz KA, *et al.* Vegetables, fruit, and cancer prevention: A review. *J Am Diet Assoc.*, 1996;51:1027.
- Thankappan K.R., Bela Shah, Prashant Mathur, P.S. Sarma, G. Srinivas, G.K.Mini, *et al.* Risk factor profile for chronic non communicable diseases: Results of a community-based study in Kerala, India. *Indian J Med Res.*, 131, January 2010,pp 53-6
- The Health Consequences of Smoking: A Report of the Surgeon General Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.2004.
- The seventh report of the joint National Committee on Prevention, Detection, Evaluation & Treatment of High Blood Pressure – US Department of Health & Human Resources – National Institute of Health, National Heart & Lung & Blood Institute – NIH Publication No. 03 – 5233 December 2003.
- Trock B, *et al.* Dietary fiber, vegetables and colon cancer: Critical review and meta-analysis of the epidemiologic evidence. *J Natl Cancer Inst*, 1990;82:650.
- Truswell AS. Dietary goals and guidelines: National and international perspectives. In: *Modern Nutrition in Helath and Disease*. Shills ME, Olson JA, Shike M, Ross AC, eds. Baltimore: Williams & Wilkins; 1999:1813.
- Usman A, Mebrahtu G, Mufunda J, Nyarang'o P, Hagos G, Kosia A,*et al.* Prevalence of non-communicable disease risk factors in Eritrea. *Ethn Dis.*, 2006 Spring; 16(2): 542-6.
- Usman A, Mebrahtu G, Mufunda J, Nyarang'o P, Hagos G, Kosia A, *et al.* Prevalence of non-communicable disease risk factors in Eritrea. *Ethn Dis*. 2006 Spring; 16(2): 542-6
- WHO. Obesity: preventing and managing the global epidemic. Report on a WHO Consultation on Obesity, Geneva, 3-5 June, 1997.
- WHO. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Consultation. WHO Technical Report series Number 854. Geneva: World Health Organization, 1995.
- World Health Organization. Dept of chronic Diseases &Health Promotion. Geneva: WHO P; 2005.Preventing Chronic Diseases: A Vital Investment WHO Global Report.
