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Effectiveness of behavioural change interventions on physical activity, diet and body mass index of public primary healthcare users in Kosovo: the KOSCO cohort

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ABSTRACT

Background Prevalent physical inactivity and poor nutrition contribute to high non-communicable disease (NCD) morbidity and mortality in Kosovo. To improve health services for patients with NCD the Accessible Quality Healthcare project developed behaviour change interventions following the principles of the WHO Package of Essential NCD (PEN) protocol. They were implemented into the public primary healthcare (PHC) system of five early-stage implementation municipalities (ESIM, 2018) and seven late-stage implementation municipalities (2020).

Objective To assess the effect of the behaviour change interventions; motivational stages of behaviour change for physical activity and nutrition; and body mass index (BMI).

Design Prospective cohort study.

Data collection and analysis We included 891 public PHC users aged 40 years and above, who were enrolled in the KOSCO (Kosovo Non-Communicable Disease Cohort) cohort in 2019 and followed-up biannually until February 2021. The PHC users who consulted for themselves any health service were approached and recruited for cohort participation. Each participant contributed up to four self-reports of nutrition and physical activity, and up to three reports of motivation to change for a better lifestyle. These outcomes were modelled prospectively with robust mixed-effects Poisson regressions. The association between behaviour change interventions and BMI was quantified using linear regression.

Results There was a high rate of smokers 20.5% and obesity 53.1%, and high rates of self-reported diagnoses of diabetes: 57.1%; hypertension 62.6%. We found no effect of residing in an ESIM, but adherence to both guidelines was higher in ESIM at the latest follow-up time point. ESIM residence was also associated with a twofold increase in the probability of reporting a high motivation for a better lifestyle and with a statistically non-significant decrease in BMI of −0.14 kg/m^2 (95% CI: −0.46 to 0.19) at the latest follow-up.

Conclusion The longitudinal results extend evidence on the effect of WHO PEN protocol in promoting physical activity and nutritional behaviour in the Kosovo context.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The effectiveness of the behaviour change interventions is assessed with three endpoints related to physical activity and nutrition (lifestyle behaviours; motivational stages of behaviour change; body mass index) and over 3 years of follow-up.
⇒ Behavioural interventions were not randomised to individuals or communities.
⇒ The answers to questions about behaviours and motivation to change are subject to reporting biases, in particular social desirability, which may have differed between participants from early-stage implementation municipalities and late-stage implementation municipalities.
⇒ We measured physical activity but not physical fitness, although the later is a more powerful health indicator

INTRODUCTION

Globally, non-communicable diseases (NCDs) are responsible for high mortality and morbidity.[1] Common preventable risk factors such as tobacco use, alcohol consumption, unhealthy diet and low physical activity as well as related obesity are linked with the four most prominent NCDs: cardiovascular disease (CVD), cancer, chronic obstructive pulmonary disease and diabetes. A decrease in the prevalence of these modifiable risk factors contributes to the reduction of the global NCD burden and can in part be achieved through behaviour change towards a healthier lifestyle.[2] A shift towards healthier behaviours can greatly delay ageing with disabilities in populations and it can also promote well-being in patients already diagnosed with chronic disease.[3]

Behaviour change interventions are a coordinated set of activities that are designed to

change an individual's specified behaviour patterns.[4] Their public health relevance is rooted in the fact that human behaviour contributes significantly to the global disease burden.[5] Understanding the health behaviours of individuals in their cultural, environmental and social contexts provides evidence for behaviour change interventions that are tailored to people's needs in the setting where they live.

Kosovo presents some of the worst health indicators in South Eastern Europe and ranks below neighbouring countries.[6] In low- and middle-income countries (LMICs), the burden of the main NCDs is increasing fast as a result of population growth, demographic ageing and lifestyle changes.[7] Kosovo is a middle-income country in South-Eastern Europe that has one of the lowest life expectancies in the region. Although health statistics are not routinely collected in the country, one national population-based study conducted in 2010, reported that the most common self-reported NCDs in adults aged 65 years and older were CVDs (63%), followed by stomach and liver disease (21%) and diabetes mellitus (18%).[8] According to the Kosovo Agency of Statistics, CVDs were responsible for 57.9% of deaths in 2012.[9] The high rates of CVD and diabetes mellitus point to the need for prevention interventions, for example, to promote healthier lifestyles.

In 2019, we observed a high prevalence of NCD risk factors in a study from the Kosovo Non-Communicable Disease Cohort (KOSCO) which is embedded into the public primary healthcare (PHC) system of the 12 Accessible Quality Healthcare (AQH) intervention municipalities. Specifically, we observed high rates of poor nutrition (85%), physical inactivity (70%), obesity (53%) and smoking (21%) among public PHC users aged 40 years and older.[10] The repeat longitudinal data from KOSCO can be used to assess the changes achieved by the AQH behavioural change interventions and to evaluate whether knowledge gained about the importance of lifestyle behaviours such as healthy eating and physical activity translates into actual or planned behaviour change.[11] The Stages-of-Change Model, also called the Transtheoretical Model (TTM), is a framework used to describe the five phases through which a person moves during health-related behaviour change. The Stages-of-Change Model has been used to understand a variety of behaviours, including smoking cessation, weight control, diet and exercise achievement.[12]

The objective of this study is to assess the impact of introducing the AQH interventions for improving diabetes and hypertension prevention and control in Kosovo, and specifically, its effect on the following indicators: (1) physical inactivity and poor nutrition; (2) motivational stages of behaviour change for physical activity and nutrition; and (3) body mass index (BMI).

METHODOLOGY

Study setting

The prospective longitudinal study KOSCO study[13] was implemented in 2019 in the 12 AQH intervention municipalities (Fushë Kosova, Gllogoc, Graçanicë, Gjakovë, Junik, Lipjan, Malishevë, Mitrovicë, Obiliq, Rahovec, Skënderaj and Vushtrri). Participant recruitment occurred consecutively at Main Family Medicine Centres (MFMCs), the largest centres at the highest level of the public PHC system. The AQH is a project by the Swiss Agency for Development and Cooperation and being implemented by the Swiss Tropical and Public Health Institute (Swiss TPH) since 2016 to improve the quality of PHC services in the public sector. AQH project has drafted a Social Behaviour Change Strategy with a focus on the prevention and control of NCDs. With the support of the project, since 2018 health information campaigns were delivered at the national level through television advertisements, radio advertisements, social media advertisements and printouts. They were composed of the following topics: (1) 'increasing knowledge of hypertension and diabetes', (2) 'promotion of physical activity', (3) 'reduction of salt and sugar', (4) 'understanding diabetes', (5) 'passive smoking', (6) 'risk factors for diabetes and hypertension' and (7) 'asthma'. In parallel, the following behaviour change interventions were implemented at the community level in a phased manner in the 12 municipalities collaborating with the AQH project, starting with five early-stage implementation municipalities (ESIM) in 2018 (Fushë Kosova, Vushtrri, Gjakovë, Mitrovicë, Malishevë), followed by seven additional late-stage implementation municipalities (LSIM) in 2020 (Lipjan, Gracanica, Junik, Skënderaj, Obiliq, Rahovec, Gllogoc).

1. Community-based education sessions raised awareness and informed community members about diabetes and hypertension risk factors, symptoms and possible health consequences. Approximately 30 participants were gathered in their communities and a healthcare provider was delivering sessions through demonstrations. After the education sessions the healthcare provider measured blood pressure and blood sugar levels of the community members.
2. Health Caravans as community-based event involved MFMCs and other key stakeholders to raise awareness of hypertension, diabetes by providing voluntary screening while ensuring diagnostic referral. This outreach activity enabled community groups to discuss various NCD topics with interactive methods where trained facilitators (usually nurses) followed a script and used tools such as posters, games and quizzes.
3. Individual motivational counselling in public PHC centres targeted all patients who were: either aged 40 years and above; diagnosed with diabetes or hypertension; had a family history of diabetes or hypertension; were smoking; or obese. According to the WHO 'Packages of Essential NCD interventions for primary care' (PEN)[10] which include a section on healthy lifestyle counselling, family doctors at MFMCs referred

targeted patients to the MFMC's Health Resource Centre. There, trained nurses provided one-to-one motivational counselling on lifestyle behaviour change according to patient needs. The motivational counselling provided by nurses specifically made use of the '5 A's Clinical Practice Guideline' (Ask, Advice, Assess, Assist and Arrange)[11] that was adapted to the Kosovo context by a working group composed of health professionals working in Kosovo. This guideline is now applied to the four main NCD risk behaviours, namely smoking, unhealthy diet, harmful alcohol use and physical inactivity.

Inclusion criteria

In 2019 all consecutive users of 1 of the 12 MFMCs who consulted for themselves any health service were approached and recruited for cohort participation if they were 40 years of age and older on the date of the interview and able to respond to questions in Albanian or Serbian. This population was chosen because they were the target group for one-to-one motivational counselling sessions and were considered at risk of having or developing NCDs.

Exclusion criteria

Participants were excluded from the study if they had one or more terminal NCDs (Stage 4 cancer, Stage 4 chronic obstructive pulmonary disease, Stage 5 chronic kidney disease, severe dementia), normally spent over 6 months of the year abroad, did not currently live in 1 of the 12 partner municipalities, or were not able to understand and respond to pre-screening questions.

Follow-up

Since the baseline assessment in 2019, participants were followed-up every 6 months, alternating between an in-person interview combined with a health assessment or just a telephone interview. Due to COVID-19 restrictions, the in-person follow-up planned in 2020 was changed to telephone and the in-person interview was delayed to the last 2020/2021 follow-up.

Data collection

The framework of the data collections is presented in figure 1. Study nurses entered responses obtained during in-person or phone interviews through a tablet into the Open Data Kit platform hosted on a secured server at Swiss TPH. Clinical measurements obtained on the day of the in-person interview consisted of blood pressure, height, weight, waist/hip/neck circumferences, peak expiratory flow and glycated hemoglobin (HbA1c) measurements.[13]

Exposure of interest

Residence in five ESIM.

Outcome measures

Self-reported adherence to physical activity and nutrition guidelines; motivational stage of behaviour change for physical activity and nutrition; (BMI; (weight (kg))/(height (m^2))).

For assessing lifestyle adherence, the participants responded to a questionnaire on physical activity and nutrition, and the responses were categorised according to WHO guidelines.[14–16] Physical activity was categorised into active versus inactive based on engaging/not engaging in ≥150 min/week moderate activity, or ≥75 min/week vigorous activity or an equivalent combination of moderate-intensity and vigorous-intensity activity. Healthy/unhealthy diet was categorised based on eating/not eating ≥5 servings/day of fruits and vegetables.

For assessing motivational stages of behaviour change related to physical activity and nutrition, the Stages of Change Model was applied. According to this model a person progresses through five behavioural stages and to assess the motivational stages of behaviour stage the questions were phrased according to the Stages of Change

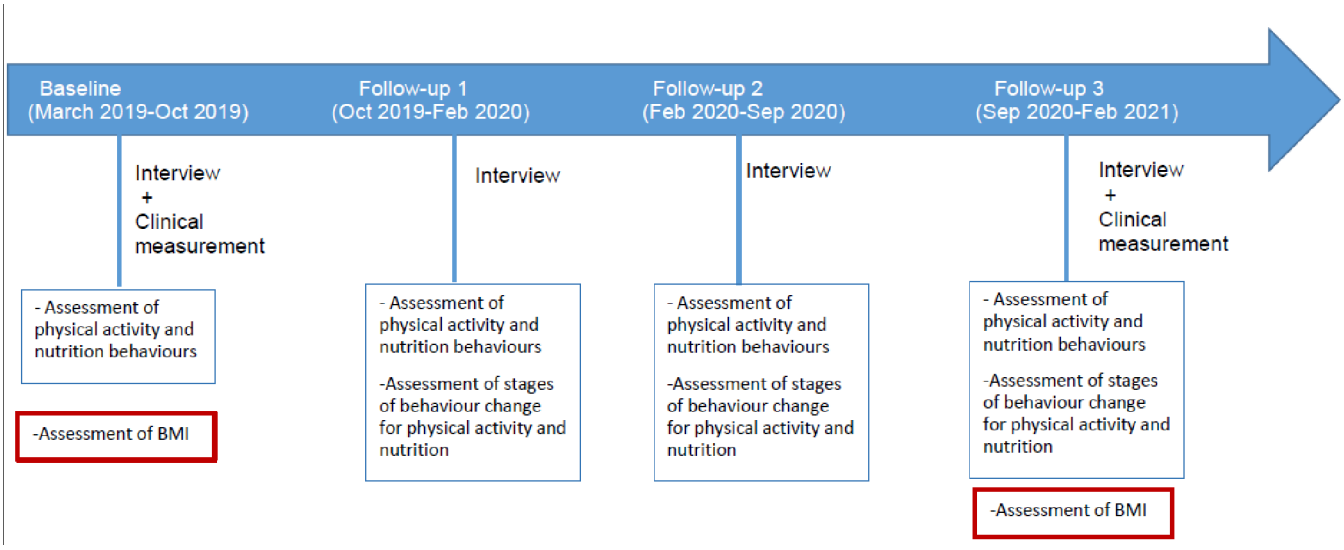

Figure 1 Framework of data collection (time-line and outcome variables for this study).
BMI (body mass index)

Model as follows: 'Precontemplation' (no intention to change behaviour in the near future and are unaware of their problems); 'Contemplation' (individuals are seriously thinking about overcoming the problem, but have not yet made a commitment to take action); 'Preparation' (individuals are intending to take action and are reporting some small behavioural changes); 'Action' (individuals modify their behaviour, experiences and/or environment to overcome the problem); 'Maintenance' (stage in which people work to prevent relapse).[17] The outcome variable was dichotomised into: (1) High motivation (Maintenance, Action, Preparation) and (2) low motivation (Contemplation and Precontemplation).[18]

Body mass index

Clinical measurements obtained on the day of the in-person interview included height (cm) and weight (kg) measured using stadiometers and scales available at the MFMCs (various brands). The accuracy of scales was assessed regularly with a weight of 10 kg. BMI was derived using the following formula: BMI=weight (kg)/height (metre^2). Obesity was considered as a BMI of ≥30.

Covariates

Sex, age, ethnicity, work status, self-reported diabetes and self-reported hypertension were a priori considered as potential confounders of the effect on lifestyle and motivation. Rural residence was considered an additional potential confounder for the effect on BMI, while self-reported diabetes and hypertension were not.

Statistical analysis for objectives 1 and 2

Each participant contributed up to four reports of nutrition and physical activity, and up to three reports of motivation for behaviour change (figure 1). These outcomes were modelled prospectively: each report was regressed on the ESIM early-stage municipality indicator, the previous report and the confounders listed above, ascertained at the time of the previous report or baseline for covariates only obtained once (sex, ethnicity, work status). For each outcome, we fitted a Poisson regression with robust error variance, thus estimating adjusted risk ratios.[19] Random intercept was included for each participant. An interaction term between the early-stage indicator and the follow-up indicator variables was used when estimating the association separately at each follow-up.

Statistical analysis for objective 3

The association of living in an ESIM on BMI was quantified using linear regression, relating the BMI at follow-up 3 to the BMI at baseline, the ESIM indicator variable and baseline confounders listed above. Only the participants who were overweight (BMI≥25 kg/m^2) at baseline were included. Robust error variance estimation was used to account for mild heteroskedasticity. We accounted for loss to follow-up with inverse probability weighting using a predictive least absolute shrinkage and selection operator (LASSO) model of missingness built on baseline covariates. The reweighted estimate was virtually identical to the unweighted, so we report only the latter. The loss to follow-up is with a retention of 67% from baseline to follow-up 3.

Patient and public involvement statement

No patient involved. It was not appropriate or possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

RESULTS

Table 1 shows the socio-demographic characteristics of the study population at baseline. The average age of the study population was 59.8 years. There were more women (58.1%) than men (41.8%). More participants lived in rural areas (56.6%) than in urban areas (43.3%). The majority of participants were married (81.5%) and only 37.6% had completed secondary school. In regards to working status, 46.9% reported being homemakers and 32.1% were retired or disabled. The vast majority were of Albanian ethnicity (91.1%). There was a high rate of smokers (20.5%) and obesity (53.1%), as well as accordingly high rates of self-reported diagnoses of diabetes and hypertension (diabetes: 57.1%; hypertension 62.6%).

Participants from ESIM were more likely to live in urban sites, be retired or disabled and reported being with diabetes or having hypertension, than participants from LSIM.

After adjusting for confounders, we found no effect of residence in ESIM compared with LSIM on self-reported adherence to WHO physical activity and nutrition guidelines overall (table 2). Analysing each follow-up separately yielded heterogeneous results. The adherence to both guidelines was statistically significantly higher in ESIM at follow-up 3, and to the physical activity guideline also at follow-up 2. However, the adherence to guidelines in these municipalities was statistically significantly worse for nutrition at follow-up 2 and (especially) for physical activity at follow-up 1, with an over 50% increase in the likelihood of reporting insufficient activity.

Residence in ESIM was associated with marked increases in the probability of reporting a high motivation for a better lifestyle: 52% for diet and 41% for physical activity overall (table 2). These effects were driven entirely by twofold increases at follow-up 3.

We found that residence in the ESIM was associated with a small, statistically non-significant decrease in BMI of −0.14 kg/m^2 (95% CI: −0.46 to 0.19) between the study baseline and the third follow-up.

DISCUSSION

The results of this longitudinal study evaluating the effectiveness of community-based behavioural change interventions over 2–3 years after their implementation are consistent with their beneficial effects on physical activity and nutritional behaviour. We also observed higher levels of motivational stages for increasing physical activity

Table 1 Socio-demographic characteristics of the study population at baseline

Characteristic	Total n (%) 891 (100)	Five early-stage implementation municipalities n (%) 362	Seven late-stage implementation municipalities n (%) 529
Age	Mean (59.8) SD (9.07)	Mean (60.5) SD (8.56)	Mean (59.2) SD (9.37)
Sex			
Male	373 (41.8)	153 (42.2)	220 (41.5)
Female	518 (58.1)	209 (57.7)	309 (58.4)
Residence			
Urban	386 (43.3)	213 (58.8)	173 (32.7)
Rural	505 (56.6)	149 (41.1)	356 (67.3)
Marital status			
Never married	14 (1.5)	5 (1.3)	9 (1.7)
Currently married	727 (81.5)	283 (78.1)	444 (83.9)
Separated	1 (0.1)	0 (0)	1 (0.1)
Divorced	9 (1.0)	3 (0.8)	6 (1.1)
Widow(er)	139 (15.6)	71 (19.6)	68 (12.8)
Education			
Primary school or less	556 (62.4)	232 (64.0)	324 (61.2)
Secondary school or higher	335 (37.6)	130 (35.9)	205 (38.7)
Work status			
Working	158 (17.7)	59 (16.3)	99 (18.7)
House person	418 (46.9)	160 (44.2)	258 (48.7)
Retired or disabled	284 (32.1)	137 (37.8)	149 (28.1)
Unemployed	29 (3.2)	6 (1.6)	23 (4.3)
Ethnicity			
Albanian	812 (91.1)	338 (93.3)	474 (89.6)
Serbian	46 (5.2)	0 (0)	46 (8.7)
Roma, Ashkali, Egyptian, other	33 (3.7)	24 (6.6)	9 (1.7)
Self-reported diabetes			
Yes	470 (57.1)	211 (60.6)	259 (54.5)
No	353 (42.8)	137 (39.3)	216 (45.4)
Self-reported hypertension			
Yes	558 (62.6)	250 (69.0)	308 (58.2)
No	333 (37.3)	112 (30.9)	331 (41.7)
Smoking			
Yes	183 (20.5)	69 (19.0)	114 (21.5)
No	708 (79.4)	293 (80.9)	415 (78.4)
Obesity (BMI≥30 kg/m^2)			
Yes	467 (53.1)	189 (52.6)	278 (53.5)
No	411 (46.8)	170 (47.3)	241 (46.4)

BMI, body mass index.

and consumption of a healthy diet. The statistically non-significant decrease in BMI among overweight ESIM residents may reflect such a beneficial effect.

The observed improvements in lifestyle behaviours and motivation to change behaviour in the ESIM were consistently stronger at the latest follow-up time point covering the period of September 2020 to February 2021. At the beginning of the study, unhealthy nutrition and physical inactivity were in fact even higher in ESIM as compared with LSIM.

We expected stronger differences between ESIM and LSIM in the earlier follow-up phases before the

Table 2 Association of residence in early-stage implementation municipalities with outcome measures*

Outcome measure	Risk ratio	95% CI
Associations averaged across follow-up waves		
Poor nutrition	0.98	0.96 to 1.01
Physical inactivity	0.98	0.92 to 1.05
Stage of change for diet (motivation for better diet)	**1.52**	**1.40 to 1.65**
Stage of change for physical activity (motivation for physical activity)	**1.41**	**1.29 to 1.54**
Associations at each follow-up		
Poor nutrition (at follow-up 1)	0.99	0.95 to 1.03
Poor nutrition (at follow-up 2)	**1.04**	**1.01 to 1.08**
Poor nutrition (at follow-up 3)	**0.90**	**0.85 to 0.96**
Physical inactivity (at follow-up 1)	**1.54**	**1.35 to 1.74**
Physical inactivity (at follow-up 2)	**0.82**	**0.73 to 0.91**
Physical inactivity (at follow-up 3)	**0.74**	**0.66 to 0.84**
Stage of change for diet (motivation for better diet) (at follow-up 2)	1.04	0.97 to 1.13
Stage of change for diet (motivation for better diet) (at follow-up 3)	**2.40**	**2.07 to 2.78**
Stage of change for physical activity (motivation for physical activity) (at follow-up 2)	0.98	0.88 to 1.09
Stage of change for physical activity (motivation for physical activity) (at follow-up 3)	**2.20**	**1.89 to 2.58**

*Adjusted for sex, age, follow-up wave, ethnicity, work status, self-reported diagnosis of diabetes, self-reported diagnosis of hypertension.

interventions were introduced into the LSIM in 2020. The opposite trend that we found could mean that behavioural change interventions may take time to induce actual behaviour change and motivation to change thereby resulting in larger effects at later follow-up time points. If so, then the effects of interventions in the LSIM are not yet visible at the time of the latest follow-up. In addition, the years 2020 and 2021 were coinciding with the COVID-19 pandemic. Unhealthy lifestyle-related diseases such as CVD and diabetes were well-recognised risks for a severe COVID-19 disease course already in the early stages of the pandemic.[20] Citizens of the ESIM previously exposed to strategies for healthy lifestyles may have become extra-motivated. The higher level of unhealthy lifestyles at follow-up 1 and follow-up 2, respectively, may reflect their generally different distribution between ESIM and LSIM. Lastly, the differences over follow-up time points may be a result of an interaction of social desirability bias with the mode of the follow-up interviews. For example, ESIM participants may have felt more strongly compelled to report high adherence and motivation than LSIM participants due to longer-lasting exposure to the intervention, but only when interviewed face-to-face at follow-up 3, not when interviewed by phone at follow-up 2.

The observed improvements in healthy lifestyle in general, and specifically in physical activity and nutrition are in line with some results from previous studies of the effects of the WHO PEN protocol and related behavioural interventions in different LMIC contexts. The WHO PEN protocols have been piloted and adopted in the PHC systems of several LMICs[21] including Bhutan,[22] the Democratic Republic of Korea[23] and Palestine.[21] According to a recent review on the effectiveness of the WHO PEN protocol,[21] most of the sites that evaluated the programme effectiveness reported improvements in the prevalence of NCD risk factors and also clinical outcomes (eg, blood sugar, blood pressure, anthropometric parameters) post PEN implementation. The periods of follow-up varied from 3 months to 2 years across these studies and were therefore slightly shorter than in the current study from Kosovo. In Korea and in Bhutan declines in risk factors were observed within 1 year of follow-up or less. In contrast, a 2-year follow-up study in Gaza/Palestine found no statistically significant difference between pre-intervention and post-intervention parameters for tobacco use and 10-year CVD risk.[21] These results point to the relevance of a context-specific evaluation of WHO PEN protocol implementations. More studies are needed to assess the effectiveness of the PEN protocols in LMICs and their sustainability.[24]

The observed average weight loss among the ESIM participants in this study is consistent with previous results suggesting that for long-term weight loss maintenance and also improved glycaemic control, a combination of diet and physical activity is more effective than either intervention alone.[25] This is also supported by additional studies showing that strategies that combine diet and physical activity are more effective than physical strategies alone. For maintained weight loss, combined lifestyle strategies are most successful.[26]

It has been reported that changes in behaviours cannot be seen from interventions in the shorter-term, but they could have a role in motivation to change from a long-term perspective.[18] Human behaviour is not linear. Undertaking stages of change suggests repetition and a cyclical pattern.[27] Motivational interviewing and TTM strategies increase the likelihood for behaviour changes by determining the person's stage of change and adapting the counselling provided.[11] Physical activity and weight management interventions incorporating behaviour change techniques have been shown to effectively move individuals from 'inactive' to 'active' stages for both behaviours.[28] The observed higher average levels of motivation to change in the ESIM are in agreement with generally positive effects of lifestyle interventions on stage of change and motivation to a healthier lifestyle. A systematic review that assessed the effectiveness of motivational interviewing on health behaviours showed that 11 out of 22 studies that included physical activity outcome measure showed positive effect. For nutrition, three out of nine studies that included measures of dietary behaviour reported positive effects of the intervention.[29] Our

observation is in line with evidence showing that motivation for change plays an important role in attending programmes or counselling sessions for lifestyle change. It is also essential for the sustainability of behaviour change, and may in fact be a prerequisite for it.[18] Yet, we are not aware of a peer-reviewed study investigating the effect of a WHO PEN protocol implementation on PHC users' motivation to change behaviour.

As the AQH project introduced different behavioural change interventions in parallel at the community level in addition to administering a national media campaign, it is not possible to assess their effectiveness independently from each other. A review of reviews of behavioural change interventions to reduce unhealthy or promote healthy behaviours identified the most effective interventions. These included physical activity and nutrition, included physician advice or individual counselling, as well as workplace-based and school-based activities. Mass media campaigns and legislative interventions also showed small-to-moderate effects in changing health behaviours. Large-scale community-based public communication interventions which aimed to prevent CVD provided high awareness and improvements in risk-reducing behaviours, such as changes to diet and increases in physical activity.[30] Beyond direct health policy intervention, barriers for healthy lifestyles need to be addressed. Environmental limitations are key determinants of behaviour. Perceived barriers to physical activity among patients with diabetes and hypertension in Kosovo were neighbourhood built environment, which entails structural barriers to physical activity.[31] Therefore, multisectoral approaches are needed to address structural barriers to physical activity.

The AQH project in Kosovo is working on strengthening PHC services in the public sector to prevent and control NCDs. Evidence shows that primary care is the right place to prevent and manage NCDs since it is the entry point for people at risk and the ones with NCDs.[32] To enable continuity of care and responsiveness to the changing disease burden, services offered in primary care need to be tailored to a defined catchment population.[33] There are many elements involved in behavioural interventions that target several interacting levels such as the individual as well as the healthcare professional that works in a specific context and within a particular healthcare system to provide services.[34] The effectiveness of an intervention is strongly linked to the personal, institutional, environmental and policy context.[3536] To increase the effectiveness of the evidence-based behaviour interventions related to diet and physical activity, healthcare system policy and other health-in-all policy changes are needed on top of the behavioural interventions.[37] Longitudinal cohorts such as the KOSCO study embedded into the PHC system have great value, both, as instrument for evaluating the effectiveness of behavioural interventions adapted to the local context and as an evidence base for guiding intervention and policy needs.[3839] It is proposed for the health system to take responsibility in a concise way to review health legislation and the role of primary care to prevent and/or treat this type of problems derived from a low adherence to healthy lifestyles.

Recommendations

National health-in-all policy approaches that support healthy lifestyles, healthy diet and physical activity need to be drafted. Task shifting from physicians to nurses for behavioural change interventions is recommended for the public PHC system which could strengthen the delivery of comprehensive NCD care.[40]

In the Kosovo context, the longitudinal results extend evidence on the effect of WHO PEN protocol rooted behaviour change interventions in promoting physical activity and nutritional behaviour.

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Contributors NP-H is the principal investigator of the KOSCO study and is the guarantor of this study. AB-K, KAO, MK and NP-H developed the framework of this manuscript and guided the implementation, data analysis and interpretation of the study findings. AB-K wrote the first draft of the manuscript and conducted the data analysis. MK supervised data analysis. AB-K, KAO, SM, MK and NP-H interpreted the study findings. KAO contributed to the development and design of the KOSCO study as well as contributed to data cleaning and data analysis. JG, MZ, QR and NF contributed to the concept and design of the KOSCO study as well as aligning the study objectives within the AQH framework. NJ ensured to align the study objectives with the Kosovo policy needs.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Consent obtained directly from patient(s).

Ethics approval Ethical approvals for the study were obtained from Ethics Committee Northwest and Central Switzerland (reference number 2018-00994) on

11 December 2018 and the Kosovo Doctors Chamber (reference number 11/2019) obtained on 30 January 2019 and expiring on 31 December 2023. Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available upon reasonable request. The data sets used and analysed in this study are available upon reasonable request by emailing the corresponding author.

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