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RESEARCH ARTICLE

# Change of body weight and lifestyle of persons at risk for diabetes after screening and counselling in pharmacies

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**Abstract** *Objective* To investigate the effects of pharmacy based counselling on changes in lifestyle and body weight. *Methods* Three months after screening a stratified sample of 3,800 randomly chosen overweight persons were addressed with questionnaires. Half a year and 1 year later the assessment was repeated. Standard counselling (SC; non-specific recommendations towards lifestyle), intensive counselling (IC; additional advice to reduce body weight) and counselling for persons at high risk for type 2 diabetes (HRC; recommendation to contact a physician) were compared. *Results* All counselling groups (SC; $n = 557$, IC; $n = 568$, HRC; $n = 245$) showed significant weight loss three months after screening (0.6–1.9 kg). A further weight reduction was observed at 1 year follow up (1.1–2.4 kg). The HRC group showed a higher percentage of weight loss than the IC or SC group after 3 months ($-2.25\%$ vs. $-1.20\%$ and $-0.67\%$; $P < 0.001$) and at 1 year of follow-up ($-2.74\%$ vs. $-1.54\%$ and $-1.29\%$; $P < 0.01$). Lifestyle changes in physical activity and/or nutrition were reported by 81.2% in the HRC group, 74.1% in the IC group and 67.0% in the SC group. *Conclusion* Immediate counselling in community pharmacies after screening for type 2 diabetes can result in significant lifestyle changes and weight loss in overweight individuals.

**Keywords** Body weight · Lifestyle change · Overweight · Pharmaceutical care · Type 2 diabetes

### Impact of findings on practice

- Counselling type-2 diabetes patients in community pharmacy is feasible.
- Counselling after screening for type-2 diabetes in community pharmacies may result in changes in lifestyle and body weight.

## Introduction

There is substantial evidence that lifestyle modifications through alterations in diet and improvement in exercise can delay or prevent progression from impaired glucose tolerance to type 2 diabetes [1, 2]. A large diabetes screening campaign in Swiss community pharmacies [3] has detected 6.9% persons with suspicion for diabetes, and 71.5% had $\geq$2 risk factors (age >45 years, overweight of BMI, body mass index, $\geq$25 kg/m$^2$, low physical activity, family history of diabetes, delivery of a baby >4 kg, and hypertension). This provided an opportunity to initiate targeted counselling regarding physical activity and/or nutrition in these individuals.

The objective was to investigate the changes of body weight and lifestyle after three different types of counselling provided to persons at risk immediately after screening for type 2 diabetes in community pharmacies.

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## Methods

### Subjects

Subjects were recruited among participants of a nationwide diabetes screening campaign in Switzerland (T0) [3]. Three months after screening (August 2002; T1) a stratified random sample of 3,800 persons received a written questionnaire. Inclusion criteria: at least 18 years old, BMI of $\geq$25.0 kg/m$^2$ and $\geq$1 additional risk factor. Sample stratification: 1,400 persons at moderate risk for type 2 diabetes and with standard counselling in the pharmacy (SC group), 1,500 persons at moderate risk for type 2 diabetes and with intensive counselling (IC group) and 900 at high risk for type 2 diabetes (HRC group). See definitions in Table 1.

Second and last questionnaire were sent in February 2003 (half year follow-up; T2) and in August 2003 (1 year follow-up; T3), respectively. The study was approved by the Ethics Committee of Basel. Subjects received no financial compensation but free of charge blood glucose measurement during the screening campaign.

### Counselling on therapeutic lifestyle change

Pharmacists were trained for counselling on risk factors in two obligatory evening courses. During the campaign, immediately after screening, the stages of change according to the transtheoretical model (Prochaska) [4] were assessed for three domains: health enhancing physical activity, reduced fat intake and consumption of five servings of fruits and/or vegetables per day ("5-a-day"). This enabled targeted counselling concerning weight reduction and lifestyle modifications using specific action plans. Pharmacists were free to provide either standard (SC) or intensive counselling (IC) to subjects at moderate risk ($\geq$2 risk factors). The SC included unspecific recommendations towards lifestyle modifications. The IC added individualised advices on weight reduction and set goals on both nutrition habits (reduced fat intake and "5-a-day" behaviour) and physical activity (half an hour physical activity daily with at least moderate intensity or three times 20 min weekly with vigorous intensity). The pharmacists recommended to call on a physician for further check up and provided SC to persons at high risk for type 2 diabetes (HRC). See Table 1 for details of interventions.

### Data collection

Baseline data were retrieved from the 35 item datasheets used during the screening campaign [3]. Three, nine and fifteen months after screening, the follow-up questionnaires, to be completed anonymously, were sent to the study participants. The questionnaires including 138 items were developed by the investigators.

All datasheets were processed with Teleform® (v. 7.0). All numeric recognitions were verified visually on screen. Data were deleted when out of a predefined plausibility range. The correct linkage of data files (a code of five numbers) was verified with data for sex and age.

### Data analysis

Outcome measures were differences in average BMI and weight, percentage of weight loss, percentage of subjects able to lose $\geq$5% of initial body weight and self-reported lifestyle change concerning diet and exercise. We compared percent change of body weight between subjects who have contacted a physician versus those who didn't in the HRC group to analyse potential impact from physician's consultation.

Change in BMI and weight over time was analysed with SPSS (v. 11.5) using repeated analysis of variance (Generalized linear model) with linear contrasts to detect differences and with counselling groups as covariates. Subsequent pair wise comparisons were performed by Tukey's-HSD multicomparison test. Different samples and counselling groups were compared by one-way ANOVA with Tukey correction for multiple comparisons; and differences in prevalences by Pearson's two-sided chi-square- or Fisher's exact test. *P*-values were calculated two-sided ($\alpha < 0.05$).

## Results

### Recruitment and characteristics of study population

Out of the 3,800 persons addressed, 2,177 returned the first, 1,520 the second and 1,436 (37.8%) all three questionnaires. Excluded were 14 subjects because of wrong linkage and 52 subjects because of missing self-reported weight data.

The study population included 1,370 subjects (mean age 59.9 years $\pm$ 11.0 (SD); 598 persons (43.6%) male; 167 subjects (12.2%) smokers). Non-responders showed significantly lower mean age and BMI. Subjects at high risk for type 2 diabetes showed a higher drop out rate than those at moderate risk.

Comparison of baseline characteristics (Table 1) shows significant differences in mean age, weight, BMI and systolic blood pressure between the HRC group and the two other counselling groups and between the SC group and IC

**Table 1** Interventions and baseline characteristics of the three counselling groups

| | | Counselling group | | |
|---|---|---|---|---|
| | | Standard counselling (SC group) $n = 557$ | Intensive counselling (IC group) $n = 568$ | High risk counselling (HRC group) $n = 245$ |
| Risk constellation | | Moderate risk (BMI $\geq$ 25 kg/m$^2$ and $\geq$1 additional risk factor[a], but normal blood glucose values[b]) | Moderate risk (BMI $\geq$ 25 kg/m$^2$ and $\geq$1 additional risk factor[a], but normal blood glucose values[b]) | High risk (BMI $\geq$ 25 kg/m$^2$ and $\geq$1 additional risk factor[a] and abnormal blood glucose values[c]) |
| Intervention | Assessment of three stages of change according to the trans-theoretical model (adequate physical activity, low fat intake, 5-a-day) | + | + | + |
| | Unspecific recommendations concerning physical activity and nutrition | + | + | + |
| | Explicit additional advice to reduce body weight including targeted counselling on weight reduction | | + | |
| | Referral to a physician for further check up | | | + |
| Comparison of baseline characteristics | Age (years)[d] | 59.4 $\pm$ 10.8 | 58.3 $\pm$ 11.6 | 64.9 $\pm$ 8.6 *** |
| | Gender[e] | | | |
| | Male | 45.1% | 36.6% | 56.7%*** |
| | Female | 54.9% | 63.4% | 43.3% |
| | Smoking habits[f] | | | |
| | Current smoker | 14.4% | 9.7% | 14.3%* |
| | Not current smoker | 85.6% | 90.3% | 85.7% |
| | Weight (kg)[g] | 77.9 $\pm$ 10.4 | 81.7 $\pm$ 11.2 | 83.6 $\pm$ 11.5*** |
| | BMI (kg/m$^2$)[g] | 27.3 $\pm$ 2.6 | 28.8 $\pm$ 3.2 | 29.0 $\pm$ 3.3*** |

[a] As additional risk factors were considered: age >45 years, low physical activity, family history of diabetes, delivery of a baby >4 kg, and hypertension

[b] Normoglycaemia: <5.3 mmol/l (capillary whole blood)

[c] Abnormal glycaemia: fasting blood glucose $\geq$6.1 mmol/l, non-fasting blood glucose $\geq$11.1 mmol/l or borderline values if confirmed by a second fasting measurement

[d] Significant differences only between HRC versus IC group and between HRC versus SC group

[e] Significant differences between all groups

[f] Significant differences only between IC versus SC group

[g] Significant differences only between HRC versus SC group and IC versus SC group (* $P < 0.05$; *** $P < 0.001$)

Values are given as mean $\pm$ SD

group only in weight and BMI. Differences in gender were statistically significant between all groups.

Change in body weight and lifestyle (Table 2)

All counselling groups showed a significantly lower body weight at T1 ($P < 0.001$). This weight loss was highest in the HRC group. At T2, a slight weight gain was observed, which was not statistically significant in the study population as a whole. A further significant weight reduction ($P < 0.001$) was observed in all counselling groups at T3. Subjects in the HRC group reached a higher percentage of weight loss than subjects in the IC and SC group at T1 (−2.25% vs. −1.20% and −0.67%; $P < 0.001$) as well as at T2 (−1.99% vs. −0.88% and −0.51%; $P < 0.01$) and at T3 (−2.74% vs. −1.54% and −1.29%; $P < 0.01$). Furthermore, subjects in the IC group reached a higher percentage of weight change than subjects in the SC group at T1 (−1.20% vs. −0.67%; $P < 0.05$), but not at T2 and at T3.

In the HRC group a trend towards higher weight loss was observed over the whole observation period in those subjects who contacted a physician ($n = 198$; 80.8%) with a weight loss of 2.40% vs. 1.67% in those subjects without consultation ($n = 47$). However, these differences were not statistically significant.

At T1, 154 subjects (11.2%) had lost ≥5% of their initial body weight (7.9% in the SC group, 11.6% in the IC group, 18.0% in the HRC group; $P < 0.001$; significant differences between all counselling groups). At T3, 253 subjects (18.5%) had lost ≥5% of their initial body weight (16.7% in the SC group, 17.6% in the IC group, 24.5% in the HRC group; $P < 0.05$; significant difference between HRC and IC and SC groups, but not between IC and SC groups).

At T1, 72.5% of the subjects in the whole study population ($n = 1,370$) reported to have changed their lifestyle with respect to physical activity and/or nutrition habits (67.0% in the SC group, 74.1% in the IC group and 81.2% in the HRC group ($P < 0.001$)).

## Discussion

Subjects in the HRC group reached a higher percentage of weight change than subjects in the IC and SC group at T1 as well as at T3. In total, 11.2% of all subjects lost ≥5% of their initial body weight at T1 and 18.5% at T3.

In two randomised controlled trials with sibutramine or orlistat [5, 6], the placebo groups showed an average weight loss of 4.6–6.1% after 24 or 12 months, respectively. In comparison, the 1.3–2.7% average weight loss observed in our study appears to be modest, but the patients in the two trials mentioned above were much more obese than in our study (average BMI 36.1 and 36.7 kg/m$^2$, respectively vs. 28.2 kg/m$^2$ in our study). Moreover, dietetic help with medical attendance was provided to the placebo groups in those trials. The weight loss in our study was achieved with only one intervention and in less obese individuals.

At T1 72.5% of all subjects declared to have changed their lifestyle. Subjects in the HRC and in the IC group were more likely to change their lifestyle than subjects in SC group. Accordingly, subjects in the HRC group showed more

**Table 2** Change of BMI, body weight and percent change of body weight

| Variable | Screening campaign (T0) | 3 months after screening (T1) | *P*-value T0/T1 | Half year follow-up (T2) | *P*-value T1/T2 | *P*-value T0/T2 | 1 year follow-up (T3) | *P*-value T2/T3 | *P*-value T1/T3 | *P*-value T0/T3 |
|---|---|---|---|---|---|---|---|---|---|---|
| BMI (kg/m$^2$) | | | | | | | | | | |
| SC | 27.3 ± 2.6 | 27.1 ± 2.7 | *** | 27.1 ± 2.7 | n.s. | ** | 26.9 ± 2.7 | *** | ** | *** |
| IC | 28.8 ± 3.2 | 28.5 ± 3.3 | *** | 28.6 ± 3.5 | * | *** | 28.4 ± 3.4 | *** | * | *** |
| HRC | 29.0 ± 3.3 | 28.3 ± 3.3 | *** | 28.4 ± 3.3 | n.s. | *** | 28.2 ± 3.3 | *** | * | *** |
| Weight (kg) | | | | | | | | | | |
| SC | 77.9 ± 10.4 | 77.3 ± 10.6 | *** | 77.4 ± 10.4 | n.s. | ** | 76.8 ± 10.6 | *** | *** | *** |
| IC | 81.7 ± 11.2 | 80.7 ± 11.4 | *** | 80.9 ± 11.7 | * | *** | 80.4 ± 11.6 | *** | n.s. | *** |
| HRC | 83.6 ± 11.5 | 81.7 ± 11.4 | *** | 81.9 ± 11.5 | n.s. | *** | 81.2 ± 11.5 | *** | * | *** |
| Percent change of body weight | | | | | | | | | | |
| SC | | −0.67% | | −0.51% | | | −1.29% | | | |
| IC | | −1.20% | | −0.88% | | | −1.54% | | | |
| HRC | | −2.25% | | −1.99% | | | −2.74% | | | |

SC: Standard counselling, IC: Intensive counselling, HRC: High risk counselling

Values are given as mean ± SD

The *P*-values refer to linear contrasts of repeated analysis of variance (* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; n.s.; not significant)

pronounced weight loss as well as self-reported lifestyle changes than subjects in the IC and SC group, probably because the blood glucose measurement in the pharmacy (and the glucose value itself) has initiated a stronger readiness for lifestyle change. No significant influence of a physician's consultation was observed in the HRC group. The larger differences in weight loss in the HRC group may therefore rather be caused by the psychological effect of the abnormal blood glucose than by physician's consultations.

Repeating this single pharmacy counselling after 3 months could possibly have enhanced the observed weight reduction and have reduced the seasonal interference. Studies have shown that the BMI is higher in winter than in summer seasons [7, 8].

The expert group ATP III [9] recommends a multifactorial lifestyle approach for reducing the risk for coronary heart disease. This so-called therapeutic lifestyle change (TLC) includes: reduced intake of saturated fats and cholesterol, therapeutic dietary options, weight reduction and increased regular physical activity. Considering our results, we would suggest that initiating TLC in community pharmacies could be a promising approach to reduce the risk for diabetes and coronary heart disease.

Our results are limited by high dropout rates over the three assessments. Ahrens [10] observed similar dropout rates, but with personal contact maintained during follow-up. Subjects at high risk for type 2 diabetes showed a higher dropout rate. Non-responders were older and showed a greater BMI than the study population. This indicates that subjects at lower risk are more concerned about their lifestyle and health and are more willing to answer three complex questionnaires. Subjects who answered all three questionnaires were probably more inclined to change their lifestyle. Unfortunately the reasons for drop out and the changes in weight and lifestyle of this population could not be assessed. Our results are further limited using self-reported data and by the uncontrolled design of the study. Furthermore, there was no randomisation, since pharmacists themselves were allowed to decide whether they provided intensive or standard counselling.

## Conclusions

Counselling after screening for type 2 diabetes in community pharmacies has resulted in significant lifestyle changes and measurable weight loss. Effects were most accentuated in persons at high risk for type 2 diabetes. Screening for type 2 diabetes in community pharmacies should be followed immediately by targeted counselling with the aim to initiate therapeutic lifestyle change in persons at risk.

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