Drug and Alcohol Dependence 239 (2022) 109600

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Gender specific early treatment for women with alcohol addiction (EWA): Impact on work related outcomes. A 25-year registry follow-up of a randomized controlled trial (RCT)

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ARTICLE INFO

Keywords:
Alcohol use disorder
Gender specific treatment
Employment
Long term follow-up
RCT

ABSTRACT

Background: Alcohol contributes to substantial economic burden, at both individual and community levels. We investigated the effect of the Early treatment for Women with Alcohol Addiction (EWA) treatment program on sickness leave, income, unemployment and early retirement pension up to 25 years following intake to treatment.

Methods: The EWA RCT included 200 women with alcohol use disorder from 1983 to 1984 at the Karolinska University Hospital, Sweden. Participants were randomized to the EWA program, a two-year specialized woman only treatment including psychiatric, interpersonal and family concerns, or treatment as usual (TAU) in a mixed gender setting. We followed the participants in the RCT from 1985 to 2009 through linkage with a national labor market registry and applied latent growth curve modeling to estimate level and change in sickness leave, income, unemployment and early retirement pension.

Findings: Relative to TAU, the EWA group had less increase in sickness leave up to 21 years after treatment. Overall, we found no differences in income between treatment groups, yet, a two-year interval analysis showed greater rise in income up to 8 years after treatment for the EWA group. Level and change in unemployment and early retirement pension did not differ between treatment groups.

Conclusions: Gender specific treatment emphasizing psychiatric, interpersonal and family issues for women with alcohol addiction had long-term positive effects on sickness leave and income. These findings complement positive clinical outcomes of the EWA treatment program on drinking patterns, mental health and mortality.

1. Introduction

Alcohol use is associated with elevated morbidity and premature mortality, increasing the risk of cancers, mental and behavioral disorders, injuries, suicides and other violent deaths (Global Burden of Disease Alcohol Collaborators, 2018). Although alcohol consumption is a modifiable health risk factor, global consumption continues to increase (Manthey et al., 2019) and is currently by far the leading cause of disability-adjusted life years, as well as early death, in the 15–49 year age group (Global Burden of Disease Alcohol Collaborators, 2018). The quantified health loss attributed to alcohol use is higher in men than women (Global Burden of Disease Alcohol Collaborators, 2018), yet,

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https://doi.org/10.1016/j.drugalcdep.2022.109600
Received 7 March 2022; Received in revised form 30 June 2022; Accepted 4 August 2022
Available online 9 August 2022

alcohol has a considerable and increasingly negative impact on women's health due to escalating use (Grant et al., 2017). Further, women have higher vulnerability to adverse health consequences related to alcohol use (Global Burden of Disease Alcohol Collaborators, 2018; Greenfield et al., 2007).

Besides impaired health, alcohol use involves a substantial economic burden, both at the individual and the community level (Thavorncharoensap et al., 2009). A review of substance use and unemployment showed that the presence of alcohol use disorders doubled the risk of moving from employment to unemployment, with persons engaging in high-risk consumption six times more likely to be unemployed compared to low-risk drinkers (Henkel, 2011). In turn, unemployment may increase the risk of escalating alcohol use (Popovici and French, 2013). While a recent review showed an overall strong association between alcohol consumption and impaired work performance (Thorrisen et al., 2019), an earlier review more specifically demonstrated an association with sickness absence, regardless of socioeconomic status, and with a stronger association for short-term relative to long-term absence (Schou and Moan, 2016). Even though there was evidence for these associations in both men and women, in two separate studies, the number of drinks per week (Johansson et al., 2009), and binge drinking (Schou et al., 2014) were more strongly associated with sickness absence in women compared to men. Contrasting this, a recent study found that risk of alcohol related work impairment was highest for males, and increased with higher education and income (Moan, 2020).

Given the relationship between alcohol use, unemployment, and sickness leave, efficacious treatments for alcohol use disorders might have the potential to improve these negative outcomes. In the beginning of the 1980 s, the Early Treatment for Women with Alcohol Addiction (EWA) program was established at the Karolinska University Hospital in Stockholm, Sweden. Aiming to improve treatment for alcohol use disorders specifically for women by reducing barriers to professional treatment, this two-year multidisciplinary treatment program focused on alcohol use as well as psychiatric, interpersonal, and family-related problems (Dahlgren and Willander, 1989; Haver and Franck, 1997). Favorable short and long term effects of EWA have been documented in several follow-up studies investigating drinking patterns, mental health, social functioning (Dahlgren and Willander, 1989; Gjestad et al., 2011a; Haver et al., 2001; Haver and Franck, 1997) and survival (Gjestad et al., 2011b), leading us to postulate better work related outcomes compared with treatment-as-usual (TAU). As the youngest women showed the most beneficial effects of the EWA program on mortality (Gjestad et al., 2011b), we hypothesized that these participants also would experience the greatest impact on work related outcomes. Previous results from the EWA program showed that about 90 % of the participants were gainfully employed at baseline, the majority were white collar workers and employees in service production, while 20 % had reduced work capacity evaluated through interviews by a study independent social worker (Dahlgren and Willander, 1989). The present study aimed to investigate levels and change in sickness leave (primary outcome), as well as income, unemployment and early retirement pension (secondary outcomes) for women with alcohol use disorders randomized to the EWA treatment program, compared to women receiving TAU up to 25 years after participation in the program.

2. Methods

2.1. Sample

From 1983–1984, 200 women in the Stockholm area, Sweden, were included in the Early Treatment for Women with Alcohol Addiction randomized controlled trial (EWA RCT) after they responded to workplace and health service advertisements. In addition to female gender, participants had to meet criteria for alcohol use disorder, while exclusion criteria were other substance abuse, previous treatment for alcohol use disorder, current psychosis or suicidality (Dahlgren and Willander, 1989). Convenience sampling was employed, and women with odd dates of birth were randomized to the EWA group, women with even dates of birth to TAU group in 1:1 allocation ratio (Fig. 1). No data are available on the number of women who declined to participate. As would be expected by chance, only a few significant differences between treatment groups were found when comparing 200 medical and social parameters at baseline, including no group differences with regard to employment status (Dahlgren and Willander, 1989).

2.2. Interventions

The EWA intervention was provided at a separate women-only unit at the Karolinska University Hospital, with high staffing ratios, in particular more doctors and psychologists than wards providing TAU. The EWA framework consisted of a short inpatient stay, indicated for about half of the participants, followed by a two-year period of frequent appointments at the adjacent outpatient unit, with the aim of therapist stability through the treatment period (Haver and Franck, 1997). The EWA content, manifested in a mutually-agreed-upon written treatment contract, included a comprehensive evaluation of drinking patterns and mental and physical health. Detoxification, psychotropic drug use, and disulfiram were treatment options both in the inpatient and outpatient period. Treatment also included individual psychotherapy and/or women-only group therapy two to three times a week, supervised by a trained psychotherapist. Partners were invited to participate in the individual treatment, and relationships with children were addressed in collaboration with a child psychiatrist. TAU took place in regular mixed-gender units at hospitals in the Stockholm area. It included the same comprehensive health and drinking evaluation at baseline as in the EWA treatment, but treatment options were limited to detoxification, psychotropic drug use, and disulfiram, in addition to regular contacts with nursing staff during inpatient or outpatient care. Health personnel and researchers affiliated with the study were not blinded while enrolling, assigning and assessing data.

2.3. Linkage and outcomes

The personal identification number assigned to all Swedish residents at birth was used to link data from the participants in the EWA RCT to a national database for labor market research, LISA (Longitudinal integrated database for health insurance and labor market studies), administered by Statistics Sweden (Anon, 2011). LISA encompasses data on gender, date of birth, emigration and death, as well as data on education, employment, and income of Swedish residents from 16 years of age. The start time in the registry period varied between the outcome variables, data on income is available from 1985, sickness leave from 1993, and employment and early retirement pension from 1994. Early retirement pension is a public pension awarded before 65 years of age due to reduced work capacity caused by illness or injury. We defined sickness leave (number of days per year) as the primary outcome, while secondary outcomes were income (Swedish Krona (SEK) per year), unemployment (number of days per year) and early retirement pension (number of months per year). Follow-up period was defined as the interval in years from enrolment in the EWA RCT until emigration, death or 12/31/2009, whichever occurred first, while individual observation time is the number of months in the follow-up period. Registry period was defined as the time of follow-up period with data from LISA database. Flow chart is provided in Fig. 1.

2.4. Statistical analysis

SPSS version 26 (IBM Corp, 2019) was used to perform descriptive and regression analysis. Other analyses were performed with Mplus version 8.4 (Muthen and Muten, 2017). Latent growth curve (LGC) modeling (Bollen, 2006; Wang and Wang, 2012) was used to analyze level and change in outcome variables over the corresponding follow-up

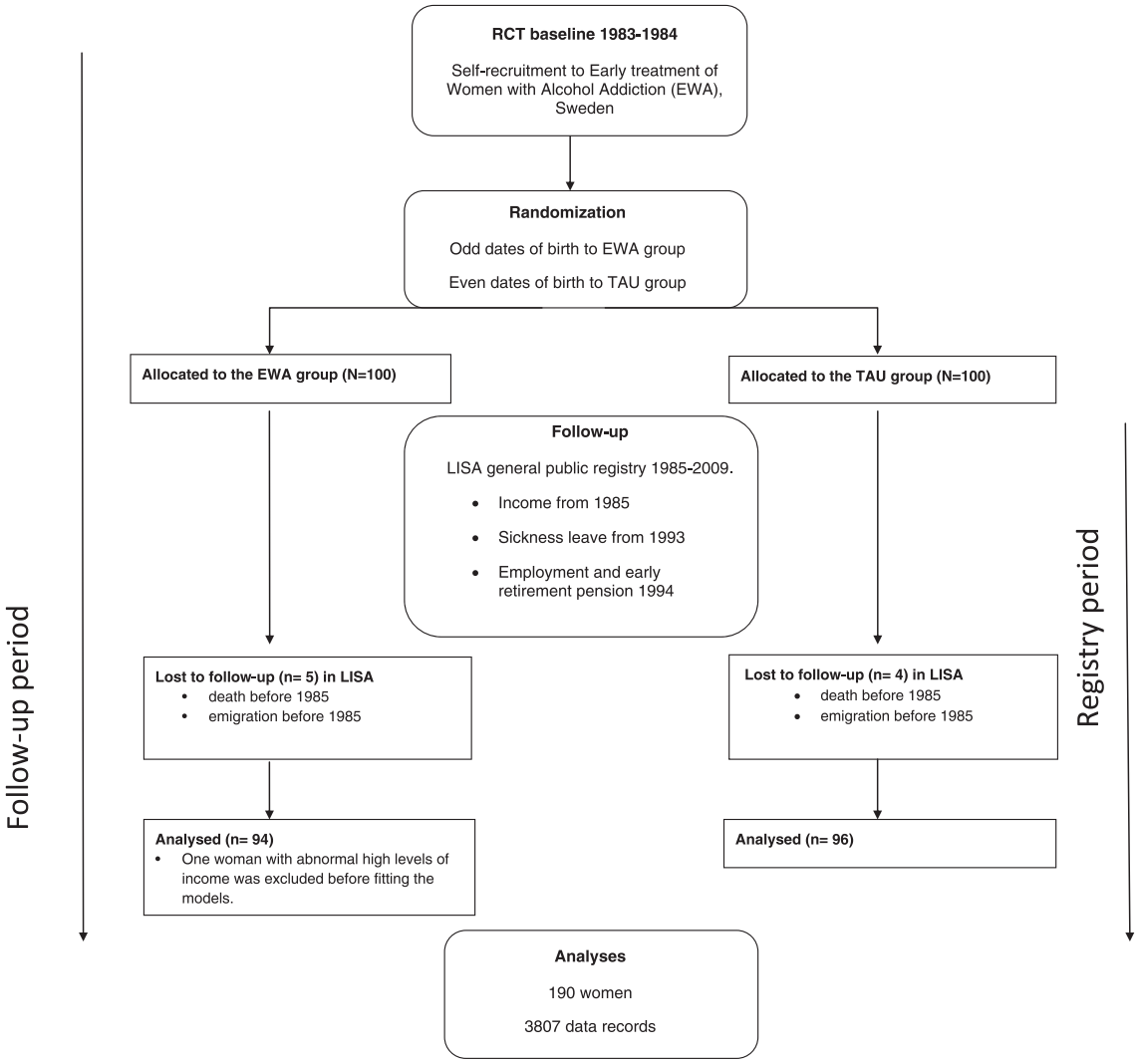

Fig. 1. Flow chart.

period. LGC models represent level and change both at mean and individual levels. The full model included random slopes and the covariance between level and change. If linear models (Kline, 2016) did not fit data, non-linear models were explored based on quadratic, cubic, and discrete-time coding (Newsom, 2015). The discrete-time models used two-year intervals with Lag 1 residual autocorrelations. Models were fitted using the Robust Maximum Likelihood (MLR) to handle deviation from normality (Muthen and Muten, 2017). Full information estimation uses all available data under the missing at random assumption, maintaining sample size and statistical power (Enders, 2010). We used standard absolute model fit, with comparative fit index (CFI) and Tucker-Lewis index (TLI) beyond 0.95 and evaluated root mean square error of approximation (RMSEA) < 0.05 as close fit, RMSEA< 0.08 as fair fit, and RMSEA < 0.10 as mediocre fit (Wang and Wang, 2012). For models not producing these values due to the type of outcome variables and estimators, model fit was evaluated by Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Sample-size Adjusted Bayesian Information Criterion (SABIC) (Wang and Wang, 2012).

The outcome variable sickness leave was not normally distributed but skewed to the right as many subjects had zero or low rates of sickness leave. Therefore, we considered this variable semi-continuous and applied two-part modeling, using logistic regression to analyze the presence of sickness leave within a given year and ordinary regression to analyze the amount of sickness leave among those experiencing sickness leave in that year (Wang and Wang, 2012). Thus, this model simultaneously analyzes changes in odds of sick leave and changes in the amount of sick leave over time. The continuous part of the model had missing data when the dichotomous part was zero, that is, when no sickness leave was present. The default logarithmic transformation was turned off for the continuous part, as the continuous variables (amount of sickness leave) were found to be normally distributed.

The outcome variable income (continuous) was explored with LGC models (linear, non-linear and a piecewise growth model with two-year intervals). The unemployment variable was skewed, and we therefore initially applied a two-part model (as outlined under sickness leave) to analyze this outcome. However, this resulted in estimation problems, and we therefore applied ordinary LGC modeling (linear and non-linear) with unemployment as a continuous variable. The outcome variable early retirement pension (continuous) was analyzed with linear and non-linear LGC models.

After fitting LGC models with levels and changes in the outcome variables as a function of year, we included treatment group (EWA vs TAU), age at RCT enrolment, and individual observation time (number of years in the follow-up period) as predictor variables. The age variable was centered to reduce multicollinearity between the main effect and the interaction term, as well as ease the interpretation of the results. After fitting the main effect models, the treatment x age interaction was explored in separate models. Non-significant and near zero main effects and interaction terms were removed to keep the model as parsimonious as possible (backward hierarchical model) (Cohen et al., 2003).

2.5. Ethics

According to the research standards at the time of the EWA RCT, eligible subjects were informed about the study before signing a written contract confirming participation. The present study was approved by Epidemiologisk Centrum/Socialstyrelsen Dnr 34-3711/2008 and the Regional Ethical Committee, Dnr 2007/740–31. The data provided to researchers were de-identified.

3. Results

3.1. Sample characteristics

Mean age at RCT enrolment in 1983–1984 was 42.5 years (SD 9.71). Forty percent (n = 77) died before end of follow-up in 2009. No harms or unintended effects attributed to the intervention were reported during the RCT. Supplementary Table 1 gives descriptive data on the study outcomes sickness leave, income, unemployment and early retirement pension by year in the registry period. Table 1 presents age at RCT enrolment and observation time during follow-up, in addition to data on sickness leave, income, number of days unemployed, and early retirement pension at start of registry period. We found no significant differences between the EWA and TAU groups, while sickness leave, unemployment and early retirement pension variables showed positive skewness.

3.2. Estimated sickness leave

The two-part model of level and change in sickness leave from 1993 to 2009 showed best model fit for the quadratic model (Model 1a-c, Supplementary Table 2). The dichotomous part of this two-part LGC quadratic model showed a reduction in the odds of leave over time for all patients (−0.21, p < .001, 95 % CI = −0.30, −0.13), while the continuous part gave a level of 36.24 days of leave in 1993 (95 % CI = 6.65, 65.83), linear change: 26.20 (p < .001, 95 % CI = 17.27, 35.13) and the quadratic change: − 1.39 (p = .003, 95 % CI = −2.30, −0.47). These results indicate that the propensity for sick leave decreased over time in the total sample, and that sickness leave first increased, then leveled out, and finally decreased over time among those experiencing sick leave.

Table 2 shows that there was no difference between EWA and TAU groups in the dichotomous part of the model estimating the likelihood of sickness leave in 1993 or in the likelihood of sickness leave over time. An interaction effect between treatment and age was present, showing that relative to younger EWA women, older EWA women had less likelihood of sickness leave over time (b = −0.01, p = .047, 95 % CI = −0.02, −0.001). In the continuous part of the model, we found no difference between EWA and TAU groups in amount of sickness leave in 1993. Linear change in sickness leave over time was related to treatment group, the EWA group had less increase in sickness leave over time compared to TAU in the first years of follow up. However, the TAU group reduced sickness leave earlier and more strongly than the EWA group, reflecting that the TAU group reversed their trend later in the trajectory. Age did not moderate the treatment group difference on the level and change in the continuous part of the model (results not presented). Fig. 2 shows that EWA and TAU groups displayed different levels and changes over time in sickness leave before reaching equal mean levels in year 2005, 21 years after treatment.

3.3. Estimated income

Linear and non-linear LGC models representing level and change in income from 1985 to 2009 showed model fit below recommended thresholds (Models 2a-c, Supplementary Table 3). The piecewise growth curve model based on two-year intervals resulted in satisfactory model fit (Model 2d, Supplementary Table 3). This model showed an overall increase in income up to1991, with increase in the intervals 1985–86 (mean change: 4.23, p = .003, 95 % CI = 1.32, 7.15) and 1989–90 (mean change 10.03, p < .001, 95 %CI = 6.21, 13.84), followed by a decrease in intervals 1997–98 (mean change −7.48, p = .003, 95 %CI = −12.50, −2.46) and 1999–2000 (mean change −4.68, p = .046, 95%CI = −9.29, −0.08). In the 1985–86 interval, the EWA group showed at mean age level a stronger increase in income (b = 7.51, p = .007, 95 % CI = 2.03, 12.99) relative to the TAU group and we found an interaction effect between treatment group and age (b = −0.51, p = .043, 95 % CI = −1.01, −0.02), indicating a larger effect of the EWA treatment for younger women relative to older ones. Whereas no group difference was found for women at mean age level in 1990–1991 (b = 5.10, p = .323, 95 % CI = −5.02, 15.23), we found an interaction effect between treatment group and age (b = −1.11, p = .004, 95 % CI = −1.87, −0.36), again demonstrating group differences in favor of younger EWA women. In 1992–1993, the opposite pattern was found: the EWA group reduced their income more than the TAU group at mean age level (b = −8.91, p = .043, 95 % CI = −17.54, −0.28), and even more among youngest women (b = 0.89, p = .048, 95 % CI = 0.00, 1.78). No statistically significant changes and interactions in the model predictors on income were found in the other time intervals.(Fig. 3).

3.4. Estimated unemployment

The LGC models estimating level and change in unemployment over 1994–2009 fitted the observed data insufficiently (Supplementary Table 3, Model 3a-3d). The level and changes were not associated with treatment group (group differences at baseline level: b = −0.57, p = .944, 95 % CI = −16.42, 15.28; linear change: b = −2.09, p = .222, 95 % CI = −5.44, 1.27; quadratic change: b = 0.19, p = .084, 95 % CI = −0.03, 0.39). We found no interaction effects between treatment groups and age.

Table 1
Overall and treatment stratified data for EWA (N = 94) and TAU group (N = 96) at start of registry period.

	Total sample			EWA		TAU		
	Mean	SD	Skew	Mean	SD	Mean	SD	*p*
Age at RCT enrolment	42.49	9.71	0.04	42.62	9.50	42.37	9.96	0.857
Observation time[a]	21.81	6.40	-1.46	22.24	6.04	21.39	6.75	0.360
Sickness leave[b]	35.26	80.38	2.76	37.21	73.87	33.29	86.87	0.752
Income[c]	64.93	48.32	0.50	63.67	47.99	66.11	48.90	0.749
Unemployment[d]	19.93	58.22	3.55	22.20	66.33	17.72	49.32	0.614
Early retirement pension[e]	1.46	3.71	2.32	1.37	3.55	1.56	3.88	0.738

p-values based on MLR estimation
[a] Observation time: number of years in the follow up period from RCT enrolment in 1983–1984–12/31/2009, emigration, or death
[b] Sickness leave (number of days) at start of registry period in 1993
[c] Income (1000 SEK) at start of registry period in 1985
[d] Unemployment (number of days) at start of registry period in 1994
[e] Early retirement pension (months) at start of registry period in 1994

Table 2
Two-Part model representing the change in probability of sick leave over time (dichotomous part), and level and change in the amount of sickness leave over time (continuous part).

	Level			Linear change			Non-linear change*		
	b	P	95% CI	b	P	95% CI	b	P	95% CI
Sickness leave or not over time (dichotomous part)									
Intercept	0.00			-0.23	< 0.001	-0.34,– 0.12		–	
EWA	-0.02	0.966	-1.03,0.99	-0.01	0.854	-0.13, 0.11		–	
Age	-0.11	< 0.001	-0.17,– 0.05	-0.01	0.024	-0.02,– 0.01		–	
The amount of sickness leave over time (continuous part)									
Intercept	32.00	0.094	-5.43,69.43	33.44	< 0.001	21.62,45.26	-2.01	< 0.001	-2.95,– 1.07
EWA	25.29	0.278	-20.38,70.96	-16.68	0.033	-32.02,– 1.34	1.26	0.023	0.18,2.35

The re-estimated backward hierarchical model with Obs.Time equal to zero in both parts and Age equal to zero in the dichotomous part.
EWA: EWA group vs Treatment as Usual (TAU) group
Age: Age at treatment intake, mean centered
Obs.Time: Observation time: number of years in the follow up period from RCT enrolment in 1983–1984 to 12/31/2009, emigration, or death
* quadratic change

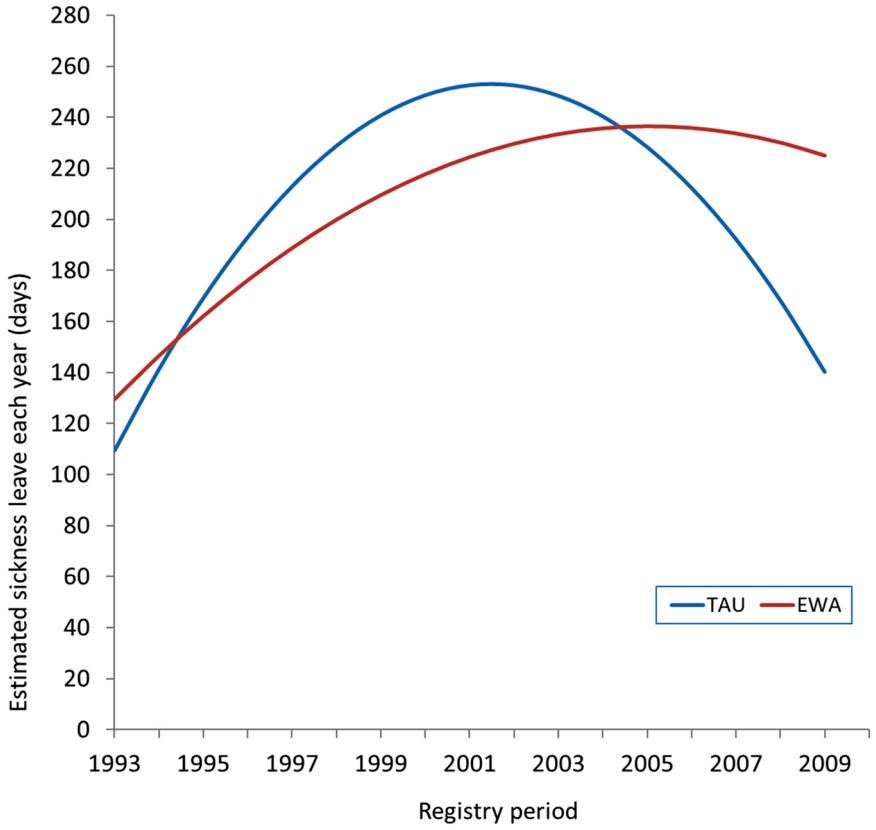

Fig. 2. Estimated sickness leave for EWA and TAU groups in the registry period 1993–2009. The estimates are based on a continuous part of a two-part model under the assumption of experiencing sickness leave in the actual year.

3.5. Estimated early retirement pension

The LGC model for the level and non-linear (quadratic) change in early retirement pension from 1994 to 2009 fitted the data well (Supplementary Table 3, Model 4b). We found equal level of early retirement pension in both groups in 1994 (1.52, 95 % CI = 0.94, 2.11). During follow up, we found no change in level of pension (linear change = −0.01, p = .950, 95 % CI = −0.20, 0.19; quadratic change = 0.01, p = .577, 95 % CI = −0.02, 0.04), no differences between treatment groups, no interaction effects between treatment groups and age nor associations with the other predictors in the model.

4. Discussion

This is a 25-year follow-up study of a RCT of a targeted women-only treatment program for alcohol use disorder showing long term beneficial impact on sickness leave and income. Compared to the TAU group treated in a mixed gender setting, the EWA group had lower increase in sickness leave up to 21 years after treatment. While both treatment groups experienced increase in income over time, the EWA women had higher income in the first 8 years after treatment, and the youngest EWA women experienced the greatest increase in income. These findings are in line with previous studies demonstrating that gender-specific treatment is crucial for women with substance disorders across a range of outcome domains, including alcohol consumption, mental health, social functioning, and mortality (Dahlgren and Willander, 1989; Gjestad

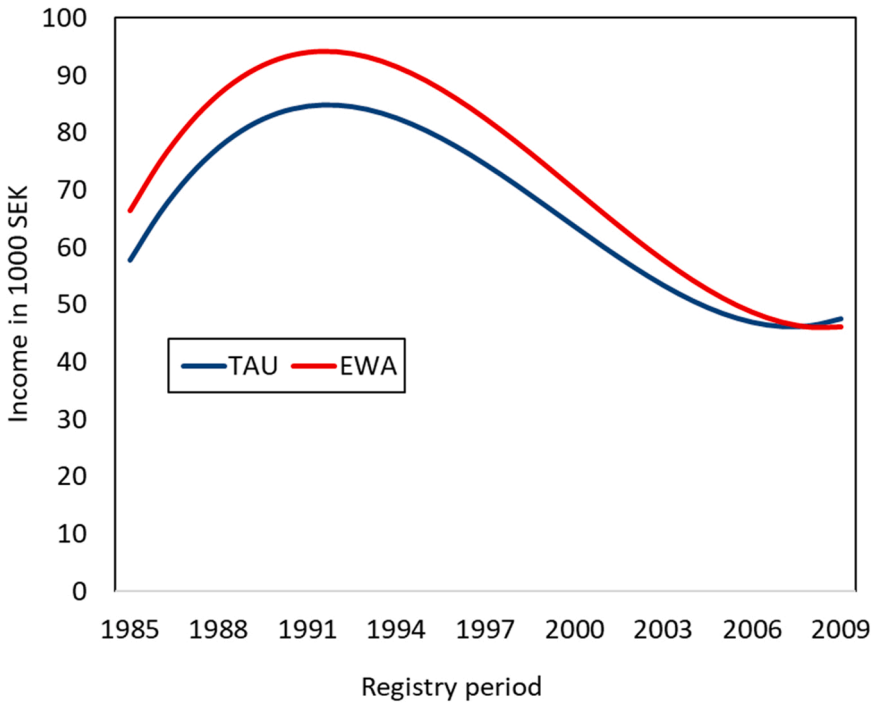

Fig. 3. Estimated mean income in 1000 SEK for EWA and TAU groups in the registry period 1985–2009.

et al., 2011a, 2011b; Greenfield et al., 2014).

There is a dearth of intervention studies targeting work specific outcomes in individuals with alcohol use disorders. One ongoing trial in England is currently exploring the effectiveness of individual placement and support (IPS) on competitive employment status among people with alcohol and drug use disorders (Marsden et al., 2020). IPS integrates personal preference, rapid job search, minimal pre-vocational training and in-work support to maintain employment (Marsden et al., 2020). The last participant was enrolled in September 2019, and the results are expected to have substantial implications for service delivery (Marsden et al., 2020). One previous intervention study explored whether employment-focused case management improves the likelihood of returning to work among 160 participants with substance use disorders (Saal et al., 2016). Although the majority of patients in this multisite trial were males with alcohol use disorders, no subgroup analyses stratified on gender or type of substance use were reported. Overall, however, no differences with regard to return to work after 12 and 24 months were found, nor did that study find any differences in abstinence, satisfaction with life, housing, or financial situation. Interestingly, even though the EWA intervention was not specifically designed to enhance work performance, we demonstrate a continuation of the earlier documented favorable effects on work performance up to 21 years after treatment. Previous follow-up studies have documented that the EWA program decreased overall alcohol consumption and risk of relapse (Dahlgren and Willander, 1989; Haver et al., 2001). This reduction in alcohol use were further associated with a decrease in alccohol related health problems such as depression and dysfunctional attitudes (Gjestad et al., 2011a), followed by better relation to children and overall enhanced social adjustments and wellbeing (Dahlgren and Willander,1989, Haver and Franck, 1997). We therefore argue that the positive effect of the EWA intervention is mediated via overall improved health due to reduced use of alcohol, rather than enabling the women to better balance alcohol use and work demands.

Although studies examining the effects of interventions on work outcomes in alcohol use disorder are lacking, several observational studies have investigated how alcohol affects sickness leave and other work-related outcomes in the general population. A study from 1992 to 2008 found an association between sale of alcohol and sickness absence lasting more than 59 days in Sweden (Lidwall , 2011), while other studies using aggregate level data demonstrated that an increase in sale of 1 liter pure alcohol per capita was associated with 13 % increased sickness absence in Norway (Norstrom, 2006; Norstrom and Moan, 2009). A recent study exploring alcohol use among nearly 90,000 participants in a Danish National Health study linked with national registries, showed that problem drinking was associated with higher probability of sickness absence, losing a job, and lower chance of re-employment (Jorgensen et al., 2019). On the contrary, only a weak association between alcohol use disorder and all cause sick leave exceeding 16 days was found among more than 2000 Norwegian twins combining diagnostic interview with sick leave registry data over the next 8 years (Torvik et al., 2015). In line with this, no alterations in the incidence of substance use related sickness absence during the 1990 s were found, even though sickness absence due to other psychiatric disorders increased in the same period (Hensing et al., 2006). In light of these observations from population-based studies, our finding of a positive intervention effect of an early treatment program on long term sickness leave is encouraging.

On the other hand, we found no effect of the EWA treatment on level or change in unemployment and early retirement pension when following the participants from 10 to 25 years after treatment. The literature on possible associations between high use of alcohol and early retirement pension/disability pension is however conflicting. No association between disability pension and ICD-10 diagnosis of alcohol dependence or abuse, assessed by the Composite International Diagnostic Interview, was found in a prospective population-based study of more than 3000 Finnish participants with 7 years follow up (Ahola et al., 2011). High-risk use of alcohol when entering military service was however associated with an increased risk of disability pension based on observation of about 50,000 Swedish male conscripts during 40 years (Sidorchuk et al., 2012).

4.1. Limitations

The present study has limitations that may impact the interpretation of the results. As always, different choice of best-fitting models could have yielded different estimates for outcomes. Nonetheless, the choice

of models had to be balanced against the issue of power to detect statistical differences between the groups. Even though we examined multiple outcomes over several outcome periods, we chose not to adjust for multiple comparisons, as this could lead to overadjustments due to associations between outcomes (Cohen et al., 2003). A larger sample size might have allowed for a more detailed analysis of associations between other baseline covariates and outcomes. Since no data existed on outcomes in the year's most proximate to the intervention before the establishment of the LISA registry, it was impossible to explore the immediate effects of the intervention. This could explain why we did not find an effect of the EWA intervention on unemployment and early retirement pension, as these outcomes lacked the first 10 years of registry follow-up. Previous studies from the EWA program have shown that the TAU group had significantly higher mortality relative to the EWA group (Gjestad et al., 2011b). If this mortality is caused by increased morbidity due to higher alcohol use in the TAU group, this group will over time encompass healthier participants than the EWA group, which is an example of the "healthy survivor bias" or "differential loss to follow up bias" (Hernan et al., 2004; Hernan et al., 2008). If the increased mortality in the TAU group is not caused by increased morbidity, but rather reflects increased mortality due to accidents or violent deaths independent of use of alcohol, our estimates will on the other hand not be biased by differential loss to follow up, yet, we find this latter scenario less likely, as there is a strong association between alcohol use and both somatic and psychiatric morbidity, and violent deaths (Global Burden of Disease Alcohol Collaborators, 2018). We argue that our finding of improved sickness leave and income in the EWA group up to 20 years after treatment represent a positive effect of the EWA program mediated via overall improved health due to reduced use of alcohol. Further, we suggest that the better long term outcomes in the TAU group between 2005 and 2009 are most likely explained by bias introduced by differential loss to follow up in combination with higher degree of uncertainty in the effect estimates due to increased censoring at the end of follow-up, and as such, this finding must be interpreted with caution. Moreover, the long follow-up period allows for other and undocumented interventions to take place when we use routinely collected data from registries to follow of participants in randomized controlled trials. This limits our ability to adjust for time-dependent variables, which can possibly bias the estimates of the intervention effect (Fitzpatrick et al., 2018). Finally, as the EWA RCT was conducted close to 40 years ago, it was not described in rigorous details in formal protocols, nor found in any clinical registry with predefined hypotheses of expected outcomes. This may limit the reproducibility of our findings and introduce outcome reporting biases inferred by post hoc selection of study endpoints and analyses (Dwan et al., 2008). Also, there is a great variation between countries regarding terms defining absence from work due to sickness, such as "sickness leave", "sick leave", "sickness absence" and "medical leave", which may reduce the generalizability of our findings.

4.2. Strengths

A major strength of this study is the use of long-term follow-up data from national registries, enabling close-to-complete evaluation of outcomes in both treatment groups. The findings of a beneficial effect of the EWA program on sickness leave and income are consistent with additional positive clinical and social outcomes found in the earlier follow-up studies of this trial (Dahlgren and Willander, 1989; Gjestad et al., 2011a, 2011b; Haver et al., 2001; Haver and Franck, 1997). Of particular interest is the observation that the youngest participants show the greatest increase in income, and also a reduction in age-adjusted mortality compared to older participants (Gjestad et al., 2011b). This finding of an overall more beneficial effect of the intervention in the youngest age group is presumably related to shorter duration of the alcohol use disorder at time of study enrolment and is highly important given the current decreased age of initiation of alcohol use, combined with the increased prevalence of alcohol use disorders among females in a range of western countries (Hasin and Grant, 2015).

5. Conclusion

In spite of limitations, the present study is unique when it comes to extensive baseline evaluations, randomization of treatment groups and novelty of the intervention, combined with the long observation period. As far as we know, comparable prospective outcome studies of treatment programs for women with alcohol use disorder do not exist. This study extends previous findings that a more intensive gender-specific alcohol treatment program may not only decrease overall alcohol consumption and mortality, but also improve long-term outcomes in work.

Role of funding source

The EWA RCT was funded by The Stockholm County Council. The studies on linkages with national registries, including LISA, were funded by the University of Bergen and the Norwegian Research Council grant number 175220. KNJ's work was supported by the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health (Award Number K23-DK120517). The funders had no influence on the scientific content of the study, including design, analyses and interpretation of results. Also, the content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Authors contributors

The deceased Lena Dahlgren initiated and conducted the EWA RCT. Brit Haver and Johan Franck obtained linkage with the LISA registries. All authors designed the present study. Rolf Gjestad conducted the analyses, Line Iden Berge drafted searched the literature and wrote the manuscript. All authors critically revised the manuscript and approved the final version.

Conflict of interest

None of the authors report any intellectual or financial conflict of interest related to the present manuscript.

Acknowledgements

We thank the participants in the EWA RCT and Staffan Lindberg, Karolinska Institutet, Sweden, for assisting in conducting the RCT.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.drugalcdep.2022.109600.

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