P.Khattri, T.R. Wind, I.H.Komproe, & P.C.Joshi

Anxiety, depression, and functioning among a population struck by recurrent floods in Uttar Pradesh, India

P.Khattri & P.C.Joshi
Department of Anthropology, University of Delhi, Delhi-110007, India

T.R. Wind & I.H.Komproe
HealthNet TPO, Department of Research and Development. Tolstraat 127, 1074 VJ, Amsterdam, the Netherlands
E-mail: twind@healthnettpo.org. Tel. +31 20 6200 005. Fax +31 20 4201 503

Abstract
Purpose The present study set out to examine the immediate impact of recurrent floods on mental health and functioning among an affected population in the rural district of Bahraich, Uttar Pradesh, India.
Methods A cohort survey was carried out in in which a group that has been repeatedly struck by floods (*n*=318) was compared with a control group in the same region (*n*=304). Mental health was assessed by the Hopkins Symptom Checklist-25 (HSCL-25), and functioning was assessed by the Short Form-12 (SF-12).
Results The affected group showed large to very large differences with the control group on anxiety, depression and total distress. Further, the affected group scored lower on most domains of psychological and physical functioning than the control group, but especially on emotional well-being. There was no relationship between indicators of mental health and functioning in the affected group, whereas this relation was present in the control group. Women scored only higher on anxiety and total distress in the affected group.
Conclusions The findings clearly show a substantial negative impact of the recurrent floods on mental health outcomes and psychological functioning. Although, we caution against early pathologization of mental health problems in the affected region, the results advocate a need to address mental health problems and impaired functioning by means of primary and secondary interventions, which have been absent in the region thus far.

Keywords Anxiety, depression, functioning, recurrent floods, India.

Introduction

Recurring disasters - and in particular seasonal floods [1]- constitute a widespread phenomenon around the globe [2;3]. Yet, disaster mental health research has dominantly focused on one-time occurring disasters, whereas only a very marginal body of research exists on the impact of recurring disasters on mental health [4]. One-time catastrophic events are typically unpredictable and extremely adverse events [5-8], and in this line disaster mental health research has been mostly trauma focused (cf. [9]). Yet, recurrent disasters such as seasonal floods do not invariantly fit this definition as these events may be relatively predictable, occur repetitiously, and might in some instances even have beneficial side effects (e.g., replenish agricultural soils [10]). Thus, although within the disaster mental health literature it is now well-established that disasters have a vast impact on mental health and functioning that disproportionably affects women [5;11-17], these findings are not automatically applicable to recurrent disasters. Hence, there is a need for studies on the impact of recurrent disasters, such as seasonal floods as is the topic of this study. Deducting from the disaster and psychotrauma literature, we put forward two opposing viewpoints on the impact of recurrent floods on mental health.

On the one hand, scholars may argue that recurrent floods evoke little mental health problems as recurrent floods are relatively predictable. From a cognitive psychological point of view [18], this predictable character of recurrent disasters is less likely to evoke unhealthy cognitive schemata about the world and the self - such as the world as an unpredictable place and the self as vulnerable – than one time occurring disasters. More pragmatically, the relative predictable character of seasonal floods provides an opportunity to develop adaptive coping strategies among individuals and communities ([19], p.32). Further, in some instances seasonal floods may even have beneficial effects, as they may create vital habitats for fish and wildlife, and replenish agricultural soils [10]. Based on these arguments, one may postulate (cf. [19], p.32) that the impact of seasonal catastrophic floods on mental health is likely to be small. Accordingly, in the only study known to the authors that was conducted explicitly on recurrent disasters, Choudhury et al [4] found a small prevalence rate of 9% psychiatric cases among Bangladeshi population that is frequently hit by disasters. Alternately, some may claim that recurrent floods have a substantial effect on mental health. Wiesenfeld and Panza [20] reason that it is often the poor segment of society that ends up in living places that are prone to recurrent natural disasters, as it is this group that may be forced to find alternative types of abode within margins of rivers. And although, the relative predictable character of seasonal floods fosters the possibility for prevention, reality shows that the necessary resources for prevention might not be accessible or allocated to people that are prone to seasonal disasters [2;3]. Within this vulnerable habitat, the already poor segment runs a high risk of losing their homes and of erosion of agricultural land over time, without a possibility to escape [20;21]. The inability to escape from this adverse situation may induce a feeling of 'learned helplessness', and in combination with cumulative loss of resources over time that encumbers the struggle to meet basic needs, recurrent disasters may evoke substantial mental health problems and impaired daily functioning (cf. [22-29]).

In light of scanty research on the topic and these contrasting lines of reasoning, the impact of seasonal floods remains unclear. In an attempt to address this gap, this study will examine early mental health consequences in the aftermath of recurrent floods among a population that resides in the rural district of Bahraich, Uttar Pradesh, India, compared to a population in the same region that is not affected. Floods are a recurrent phenomenon in the Bahraich district. In the year 2008, the district Bahraich was struck by floods twice, first in the month of July and again in the month of September, which led to large scale damage to houses and erosion of agricultural land in the area. The aims of the study are three-fold: First, we will investigate the impact of the flood on mental health outcomes (anxiety, depression, and distress), and daily functioning. Second, we will examine the relation between mental health outcomes and functioning, as this has been argued to be an important indicator to develop mental health services ([30] p.46; cf. [31]). Third, we will compare the impact of the flood on mental health outcomes and functioning across gender.

Method

Subjects

A cohort survey was carried out in the district of Bahraich, Uttar Pradesh, India, from October 1st to 15th in 2008. The Bahraich region in India is annually hit by floods, and in July and September 2008 the region was again severely hit by floods. Within Bahraich, the four most flood affected Gram Panchayats (the local name for the smallest political unit in the region) were chosen on the basis of impact of the flood and their geographical location between the river and the embankment that made them most vulnerable upon discussions with the district officials and with several NGOs in the region. The sampling frame for the control group consisted of the Gram Panchayats that are situated on the other side of the embankment. It was made sure that these Gram Panchayats were not at all affected by the floods meaning that neither the houses were damaged nor the agricultural land was eroded due to floods. Four such Gram Panchayats situated directly opposite to the affected Gram Panchayats were selected.

A list of all the households in the specific Gram Panchayats was obtained according to the name of the head of the household. We aimed to administer the interview to 330 households in the affected group and 330 households in the control group. We took into account a proportion of approximately 15% of migrated households as a result of the flood. Thus, we randomly sampled 380 flood-affected households. We randomly sampled 330 households in the control group. No respondents refused to participate in the survey exercise. However, due to migration within the sample of affected households and as a result of absence of households in both the affected and the control group, we were able to administer the interview to the head of the 318 affected respondents (83.7%) and 304 control respondents (92.1%).

Demographic information of the samples is summarized in Table 1. In the affected sample 39.0% of the sample was female and 61.0% of the sample was male. In the control group, 44.1% was female and 54.9% was male. The mean age was 46.03 years (SD=15.74) in the affected group and 47.23 years (SD=13.92) in the control group. Of the affected group 64.1% was literate and 35.9% was illiterate. In the control group 52.6% was illiterate and 47.4% was literate. In the affected group 72.8% had no education, 10.5% had primary education, 10.8% had secondary education, 4.3% had higher secondary education, and 1.5 % were graduates. In the control group 65.4% had no education, 16.1% had primary education, 10.2% had secondary education, 7.2% had higher secondary education, and 1.0% were graduates. The mean years of education was 2.17 (SD=3.70) in the affected group and 2.45 (SD=3.65) in the control group. In the affected sample 92.1% was Hindu, 7.5% was Muslim, and .3% had a religious affiliation other than Hindu or Muslim. In the control sample, 71.7% was Hindu and 27.3% was Muslim.

Table 1. Demographics

	Flood affected sample (n=318)	Control sample (n=297)
Gender (%)	39.0% Female	44.1% Female
	61.0% Male	54.9% Male
Mean age (SD)	46.03 (15.74)	47.23 (13.92)
Literacy (%)	64.1% Illiterate	52.6% Illiterate
	35.9% Literate	47.4% Literate
Education (%)	72.8% No education	65.4% No education
	10.5% Primary education	16.1% Primary education
	10.8% Secondary education	10.2% Secondary education
	4.3% Higher secondary educ.	7.2% Higher secondary educ.
	1.5 % Graduate	1.0% Graduate
Year of education (SD)	2.17 (3.70)	2.45 (3.65)
Religion (%)	92.1% Hindu	71.7% Hindu
	7.5% Muslim	27.3% Muslim
	.3% other	

Note: SD = Standard Deviation

Instruments

Symptoms of anxiety and depression were assessed by the Hopkins Symptom Checklist-25 (HSCL-25). The HSCL-25 derived from the 90-item Symptom Checklist (SCL-90; [32;33]), and is a screening tool designed to detect symptoms of anxiety and depression. It is composed of a 10-item subscale for anxiety and a 15-item subscale for depression, with each item scored from 'not at all' (1) to 'extremely' (4). We had to preventively omit an item

concerning sexual interest because of the taboo associated with talking about sexual issues. The period of reference is the last month. The HSCL-25 has widely been used in studies among refugees in both western (e.g. [34]) and non-western settings (e.g. [35;36]). In the vicinity of North India, the HSCL has been used among Tibetan refugees in India [37] and among Nepalese internally displaced persons [38]. The HSCL-25 has been used previously in disaster research [39]. Although the cutoff score of 1.75 has become widely accepted in cross-cultural research [38;40], the HSCL-25 has never been validated as a screening instrument for depression and anxiety in India. Therefore, we report on mean scores of anxiety and depression, rather than prevalence rates. Three scores were calculated: The anxiety score is the average of the 10 anxiety items; the depressive symptoms score is the average of the 14 depression items; and the total distress score is the average of all items. The internal consistency of the scales was acceptable to good. In the affected sample the Cronbach's alphas of anxiety, depression, and the total distress score were respectively .81, .69, and .80. In the control sample the Cronbach's alphas of anxiety, depression, and the total distress score were respectively .90, .89, and .94.

Functioning was assessed by using the Short Form-12 (a shortened version of the Medical Outcome Study 36 Item Short-Form Health Survey [SF-36; [41;42]), one of the most extensively used assessments of functioning worldwide [43]. The SF-12 assesses respondents' functioning during the previous 4 weeks, using 12 items along two summary scales (Mental Health Component and Physical Health Component), each comprising 4 subscales. The mental health summary measure encompasses items on the subscales role-emotional functioning, mental health, vitality, and social functioning (e.g., Feeling calm and peaceful, during the past 4 week). The physical health summary score consists of items focusing on physical functioning, role-physical functioning, pain, and perceived general health (e.g., How much pain interfered with normal work including both work outside the home and housework, over the preceding 4 weeks.). Following recommended scoring algorithms, the items were converted into *z*-scores, weighted, and summed to form mental health and physical health summary scales [44]. This algorithm was designed so that scales would range from around 0 (worst health) to around 100 (best health), have a mean close to 50, and have a standard deviation close to 10. Some scholars have put the utility of the summary scores into question [45], but most researchers find that these measures have good validity and reliability (e.g., [46-48]). The internal consistency of the scales was acceptable to good. In the affected sample the Cronbach's alphas of the mental health component and the physical health component were respectively .68 and .80. In the control sample the Cronbach's alphas of the mental health component and the physical health component were respectively .73 and .71.

Procedures

Students of the University of Delhi and the Lucknow University familiar with the local sociocultural context and dialect administered the survey under the close supervision of the local principal investigator Joshi (author). They received two days of training in the administration of the instrument. All respondents gave their informed consent prior to their inclusion in the study. If possible written informed consent was obtained. In case of illiteracy verbal informed consent and thumb impression was attained and recorded by a witness.

Although the HSCL-25 is already available in many languages, it had not yet been translated into the local language spoken in Northern India (Hindi). We translated the questionnaire by means of backtranslation. This involved translation from English into Hindi. The Hindi version was then taken to the field and adopted according to the local dialect and use of words. Thereafter, the Hindi version was translated to the original English by back-translation. Finally, the original English version was compared with the backtranslated English version. No important differences between the original and the translated version were found.

The ethical clearance for the study was obtained from the ethical committee of the Department of Anthropology, University of Delhi. The study has been performed in accordance to the ethical guidelines of the Declaration of Helsinki 1997.

Statistical analysis

Seven respondents within the control group had a substantial amount of missing values, which rendered analyses of their results futile (for these respondents approximately half or more of the values were missing). These 7 respondents were excluded from the analyses. Among the remaining respondents, individual scale scores were obtained by computing the average of the completed items pertaining the subscale, on the condition that no more than 2 items were missing. For no one of the remaining respondents more than 2 items were missing per subscale.

We conducted student t-tests for means to investigate differences between the affected and control group and between women and men in mental health outcomes (Anxiety, depression, and Total Distress) and summary scales (Mental Health Component and Physical Health Component) and subscales (Vitality, Social functioning, Role-emotional, Emotional well-being, Physical functioning, Role-physical, Bodily Pain, and General Health) of

Functioning. Additionally, we calculated effect sizes. According to Cohen [49] effect sizes of < .10 are close-to-zero, of .11 - .35 are small, .36 - .65 are moderate, of .66 – 1.00 are large and of > 1.00 are very large.

Hierarchical regression analyses were performed separately for the affected and the control group to identify predictors of two measures of functioning: the Mental Health Component and the Physical Health Component. We added relevant demographics (Gender, Age, Literacy, Education, Years of education, and Religion) in Step 1, and Anxiety and Depression in Step 2. Total Distress was not added in step 2 as it is embodied by Anxiety and Depression. To check that the data met the assumptions of linearity, homoscedasticity and normality of residuals, the plots of the standardized residuals against the standardized predicted values, and the P–P plot of the residuals were inspected for each multiple regression model tested.

Data were analyzed in SPSS for Windows, version 16.0.

Results

There were no significant differences on socio-demographic variables between the affected and the control group except for religion ($X^2(1)=43.16$; $p < .001$; Table 1).

Differences in mental health outcomes between the affected and control group

Table 2 shows that the affected group scores significantly higher than the control group on the scales Anxiety (M=2.52; SD=.63 and M=1.92; SD=.67 respectively; t(623)=11.43; p<.001), Depression (M=2.48; SD=.40 and M=1.89; SD=.56 respectively; t(529)=13.77 ; p<.001), and Total Distress (M=2.54; SD=.40 and M=1.90; SD=.57 respectively; t(515)=14.77 ; p<.001). The effect sizes show a large difference for Anxiety (d = .92), and very large differences for Depression (d = 1.22) and Total Distress (d =1.30) between the affected group and the control group. The affected group scored higher than the control group on all symptoms (data not shown).

Table 2. Mean and standard deviations of Anxiety, Depression and Total Distress in the affected and control group.

	Flood affected sample (n = 318)	Control sample (n = 297)	d
Anxiety (SD)	2.52 (.63)*	1.92 (.67)*	.92
Depression (SD)	2.48 (.40)*	1.89 (.56)*	1.22
Total Distress (SD)	2.54 (.40)*	1.90 (.57)*	1.30

Note: SD = Standard Deviation. *$p < .001$

Differences in functioning between the affected and control group

Table 4 shows the means, standard deviations and effect sizes for the summary measures and subscales of functioning for the affected and the control group.

The affected group scores significantly lower on the Mental Health Component as an indicator of Functioning (M=37.95; SD=23.78) than the control group (M=45.59; SD22.52) (t(611)=9.91; $p < .001$). The subscales of the mental health summary scale revealed significant differences between the affected and the control group on Vitality (M=41.57; SD=26.22 for the affected group and M=47.23; SD=26.97 for the control group; t (612)=2.64; $p < .01$), Social Functioning (M=44.34; SD=26.70 for the affected group and M=59.54; SD=28.44 for the control group; t (612)=6.83; $p < .001$), Role-Emotional (M =17.92; SD=36.09 for the affected group and M=40.85; SD=44.24 for the control group; t (611)=7.05; $p < .001$), and Emotional well-being (M=29.97; SD=19.42 for the affected group and M=50.71; SD=22.15 for the control group; t (612)=12.36; $p < .001$). The difference between the flood-affected and the control group was small for the summary measure 'mental health component' (d = .33). For the subscales of the mental health component the difference between the flood-affected group and the control group was small for Vitality (d = .21), moderate for Social Functioning (d = .55) and Role-emotional (d = .57), and large for Emotional well-being (d = 1.00).

The affected group scores significantly lower on the Physical Health Component as an indicator of Functioning (M=33.45; SD=17.79) than the control group (M=49.57; SD=22.34) (t(612)=4.08; $p < .001$). The subscales of the Physical Health Component revealed no significant difference between the affected and the control group on Physical functioning, and significant differences between the affected and the control group on Role-physical (M=26.57; SD=41.39 for the affected group and M=39.52; SD=44.63 for the control group; t(612)=3.73; $p < .001$), Bodily Pain (M =48.19; SD=32.55 for the affected group and M=60.98; SD=32.25 for the control group; t(612)=4.89; $p < .001$), and General health (M=23.03; SD=27.41 for the affected group and M=27.20; SD=24.52 for the control group; t(612)=1.98; $p < .05$). The difference between the flood-affected and the control group was large for the summary measure 'Physical Health Component' (d = .80). For the subscales of the physical health component the difference between the flood-affected group and the control group was close-to-zero for physical functioning (d = .02), small for Role-physical (d =.30) and General health (d = .16), and moderate for Bodily Pain (d = .39).

Table 3. Mean and standard deviations of functioning subscales in the affected and control group.

	Flood affected sample (n = 318)	Control sample (n = 297)	d
Mental health component (SD)	37.95 (23.78) *	45.59 (22.52) *	.33
Vitality (SD)	41.57 (26.22) **	47.23 (26.97) **	.21
Social functioning (SD)	44.34 (26.70) *	59.54 (28.44) *	.55
Role-emotional (SD)	17.92 (36.09) *	40.85 (44.24) *	.57
Emotional well-being (SD)	29.97 (19.42) *	50.71 (22.15) *	1.00
Physical health component (SD)	33.45 (17.79) *	49.57 (22.34) *	.80
Physical functioning (SD)	54.01 (32.05)	54.65 (31.72)	.02
Role-physical (SD)	26.57 (41.39) *	39.52 (44.63) *	.30
Bodily Pain (SD)	48.19 (32.55) *	60.98 (32.25) *	.39
General health (SD)	23.03 (27.41) ***	27.20 (24.52) ***	.16

Note: SD = Standard Deviation. * $p < .001$; ** $p < .01$; *** $p < .05$

Hierarchical regression analyses of mental health on functioning

The data met the assumptions of hierarchical linear regressions (linearity, homoscedasticity and normality of residuals).

For the affected group, the hierarchical regression analyses (see Table 4) showed that there were no significant predictors of the Mental Health Component and the Physical Health Component of Functioning: neither socio-demographic variables, nor mental health outcomes (Anxiety and Depression) predicted the Mental Health Component (R^2 = .03, F(8, 207) = .73, n.s.) and Physical Health Component of Functioning (R^2 = .04, F(8, 209) = .79, n.s).

For the control group, the hierarchical regression analyses revealed that in the first step in which the socio-demographic variables were included, Age was a significant predictor of the Mental Health Component of functioning. Higher Age was associated with lower Mental Health Functioning. In the second step, in which Anxiety and Depression were added, Anxiety predicted mental health functioning. Higher Anxiety was associated with lower Mental Health Functioning. With the inclusion of Anxiety and Depression, the contribution of Age decreased substantially. Further, in the control group Age and Religion predicted Physical Functioning in the first step. Higher age was associated with lower physical health functioning and Muslims reported less Physical Functioning than Hindus. In the second step, Age continued to be significant and in addition Anxiety predicted Physical Functioning. Higher age and higher Anxiety was associated with lower Mental Health Functioning. After the second step, with all independent variables in the equation, R^2 = .35, F(8, 209) = 13.76, $p < .001$, for the regression with Mental Health Functioning as the outcome and, R^2 = .29, F(8, 210) = 10.55, $p < .001$, for the regression with Physical Health Functioning as the outcome (see Table 4).

Gender differences in mental health problems and functioning in the affected and control group

In accordance with the disaster mental health literature, we tested the one-sided hypothesis that men score lower than women on mental health problems and functioning. The results are depicted in Table 5.

Within the disaster-affected group men (M=2.44; SD=.63) score significantly lower than women (M=2.65; SD=.62) on Anxiety (t (316) = 2.91; $p < .05$), and men (M=2.60; SD=.42) score significantly lower than women (M=2.50; SD=.38) on Total Distress (t (242) = 1.95; $p < .05$). The difference between the men and women was moderate for Anxiety (d = .40) and small for Total Distress (d = .25). Men did not score significantly lower than women on Depression within the disaster-affected group.

Within the control group, neither did men and women differ significantly on mental health (Anxiety, Depression, and Total Distress), nor did men and women differ significantly on scores of functioning (Mental Health Component and Physical Health Component).

Table 5. Mean and standard deviations of Anxiety, Depression, and Total Distress for men and women in the affected and control group.

	Affected group			Control group		
	Men (n = 194)	Women (n = 124)	d	Men (n = 165)	Women (n = 132)	d
Anxiety (SD)	2.44 (.63)*	2.65 (.62)*	.40	1.87 (.61)	1.98 (.73)	.17
Depression (SD)	2.45 (.36)	2.53 (.44)	.20	1.89 (.56)	1.88 (.57)	.02
Total distress (SD)	2.60 (.42)*	2.50 (.38)*	.25	1.88 (.54)	1.92 (.61)	.07
Mental health Component (SD)	33.52 (17.85)	33.35 (17.76)	.01	45.66 (21.30)	45.50 (24.03)	.01
Vitality (SD)	41.13 (27.02)	42.26 (25.02)	.04	49.15 (27.16)	44.85 (26.63)	.16
Social functioning (SD)	45.36 (27.01)	42.74 (26.24)	.10	61.74 (28.03)	56.82 (28.83)	.17
Role-emotional (SD)	17.27 (36.32)	18.95 (35.84)	.05	40.80 (43.83)	40.91 (44.90)	.00
Emotional well-being (SD)	30.31 (20.36)	29.44 (17.91)	.04	52.26 (22.57)	48.79 (21.54)	.16
Physical health component (SD)	37.89 (23.37)	38.05 (24.49)	.01	50.97 (22.41)	47.84 (22.22)	.14
Physical functioning (SD)	53.22 (32.88)	55.24 (30.79)	.06	53.66 (32.32)	55.87 (31.02)	.07
Role-physical (SD)	26.80 (41.39)	26.21 (41.55)	.01	39.63 (43.43)	39.39 (46.24)	.01
Bodily Pain (SD)	48.45 (33.44)	47.78 (31.24)	.02	61.59 (31.86)	60.23 (32.83)	.04
General health (SD)	23.07 (26.80)	22.98 (28.44)	.00	27.74 (24.30)	26.51 (24.86)	.05

Note: SD = Standard Deviation. *$p < .05$

Discussion

The present study set out to gain insight in impact of seasonal floods on mental health and functioning. We tried to answer three issues: (1) to examine the impact of recurrent floods on mental health and functioning; (2) to investigate the relation between mental health and functioning; and (3) to compare the impact of the flood on mental health outcomes and functioning across gender.

For the first question, the findings clearly showed a dramatic negative impact of the recurrent floods on mental health outcomes. There were large to very large differences between the flood-affected group and the control group on anxiety, depression and total distress. These results demonstrate a higher impact on mental health than the modal study on one-time occurring natural disasters (e.g., [23;26;50]), and a similar impact on mental health as previous studies that reported severe impacts of one-time occurring natural disasters on mental health (e.g., [5;15;51]). The findings further showed an impact of the recurrent floods on functioning. In comparison to the control group, the flood affected group reported low social functioning, vitality, and high problems with work or daily activities as a result of emotional problems, and especially low on emotional well-being. In addition, the affected group scored lower on several domains of physical functioning: The flood victims reported poorer general health, experienced more limiting pain in their work activities, and experienced more problems in work or daily activities as a result of physical problems.

Related to the second question, our study showed that in the affected group neither anxiety nor depression explained the level of functioning of individuals. Yet, in the control group the mental health problems explained more than a quarter of the variance of psychological functioning and slightly less than a quarter of the variance of physical functioning. In the control group anxiety was associated with debilitated daily functioning (both psychological and physical functioning) and older people scored less on physical functioning. It is our experience in the region under study that the seasonal floods cumulatively deplete the resources that are necessary for survival (shelter and crops), and this cumulative loss of resources may explain for the substantial impact of recurrent floods on both mental health and functioning (cf. [11;20;23;28;52]). This loss of resources, i.e. eroded context, may have fully mediated the relationship between mental health and functioning. Unfortunately, we were unable to test this contention. The implication of the absence of a relation between functioning and mental health in the affected group is important, as according to the DSM IV [53], the combination of mental health problems and impaired functioning constitutes a disorder. Hence, the results cautions against premature pathologization of mental health complaints (cf. [54;55]), and favor the claim that impaired daily functioning and mental health problems in the immediate aftermath of a recurrent flood is a normal reaction to a negative change in the context (cf. [54;55]).

For the third question, the study assessed gender differences vis-à-vis the impact of the flood on mental health symptoms and functioning. In line with literature on one-time occurring disasters [5;11;56;57], the findings revealed that women scored higher on anxiety symptoms and general distress in the affected group. Yet, the study revealed no gender differences on depression and domains of functioning in the affected group, and none at all in the control group. We contemplate that under prolonged harsh circumstances of facing recurrent floods, the difference in functioning that is found in disaster research, vanishes. Under these circumstances, both men and women may have problems with functioning as the fulfillment of both traditional social roles (the man as the breadwinner and the woman as a caregiver) is difficult [58;59]. Consistent with this hypothesis, it is our experience in the region that as a result of the seasonal floods men have difficulty providing for their family as agricultural land is eroded (the local main source of income), and women reported the inability to protect and care for the children or the elderly. Hence, the lack of differences in functioning might reflect a ceiling effect, in which differences between flood-affected men and women are absent.

The findings of this study should be interpreted in light of various limitations. First, the study set out to describe the impact of seasonal floods. Because we relied on a cohort-study, we cannot dissect the impact of the recent flood from the impact of the experience of previous floods. Despite this limitation, the results show a greater impact of the floods on mental health than the modal rapid assessment study on one-time catastrophic events conducted within the first month [60-62], that is most likely the result of being exposed to repetitious floods. Second, the results pertain to those who continued living in the flood area and we do not have data on those who moved out of the area after the flood. Third, the affected and the control sample are not identical in terms of demographic variables. Although we controlled for socio-demographic variables in the regression analyses, the difference may have confounded other analyses. We add that our study is not representative for all recurrent floods, as some recurrent disasters may have beneficial effects as outlined by Wisner et al. [10], and may very well have a lower impact on mental health and functioning than reported in our study (cf. [19]).

Regardless of the limitations, the study adds to the scanty body of literature on the impact of recurrent disasters on mental health. The study reveals a substantial impact of recurrent floods on mental health and functioning. It is our hope that research on recurrent disasters will be expanded in the future. Although, we caution

against early pathologization of mental health problems in the affected region, the results advocate a need to address mental health problems and impaired functioning by means of primary and secondary interventions that have been absent in the region thus far.

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Conflict of interest
The authors declare that they have no conflict of interest.

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Table 4. Hierarchical regression analyses on two measures of functioning for the affected and the control group.

	Affected group						Control group					
	Mental health component			Physical health component			Mental health component			Physical health component		
	B	SE B	β	B	SE B	β	B	SE B	β	B	SE B	β
Step 1												
Gender	2.31	2.51	.06	1.75	3.43	.04	1.55	3.02	.03	.16	2.88	.00
Age	-.025	.06	-.03	-.06	.08	-.06	-.23	.09	-.19**	-.29	.08	-.24**
Literacy	-.76	5.62	-.02	-7.02	7.66	-.14	-12.24	7.59	-.27	-3.42	7.26	-.08
Education	2.17	3.79	.17	7.27	5.16	.41	5.53	5.12	.38	-.32	4.89	-.02
Years of education	-.58	1.13	-.11	-2.57	1.54	-.36	-1.38	1.39	-.25	-.11	1.32	-.02
Religion	-4.68	4.88	-.07	-4.68	6.65	-.05	-5.66	3.39	-.11	-6.60	3.24	-.14***
Step 2												
Gender	1.79	2.53	.05	1.79	2.53	.05	.03	2.56	.00	-1.31	2.57	-.03
Age	-.02	.06	-.02	-.02	.06	-.02	-.11	.08	-.09	-.19	.08	-.16***
Literacy	-.07	5.62	-.00	-.07	5.62	-.00	-9.05	6.40	-.20	-.70	6.43	-.02
Education	1.4	3.82	.11	1.44	3.82	.11	2.81	4.33	.19	-2.61	4.34	-.19
Years of education	-.33	1.14	-.06	-.33	1.14	-.06	-.92	1.17	-.17	.26	1.17	.05
Religion	-4.44	4.87	-.07	-4.44	4.87	-.07	-2.39	2.87	-.05	-3.86	2.88	-.08
Anxiety	-1.59	2.35	-.05	-1.59	2.35	-.05	-15.06	2.94	-.45*	-13.33	2.96	-.42*
Depression	-3.91	3.46	-.09	-3.91	3.46	-.09	-4.96	3.43	-.13	-3.03	3.45	-.08

Note: * $p < .001$; ** $p < .01$; *** $p < .05$

R^2 is n.s. step 1; ΔR^2 is n.s. for step 2 of the Mental Health Component in the Affected group;

R^2 is n.s. step 1; ΔR^2 is n.s. for step 2 of the Physical Health Component in the Affected group;

$R^2 = .06$ for step 1, $p < .05$; $\Delta R^2 = .29$ for step 2 $p < .001$ of the Mental Health Component in the Affected group;

$R^2 = .07$ for step 1, $p < .05$; $\Delta R^2 = .22$ for step 2 $p < .001$ of the Physical Health Component in the Affected group.