EPIDEMIOLOGY AND PREVENTION OF DROWNING IN NORTHERN IRAN: A COMMUNITY BASED PROGRAM

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Abstract

**Background:** Drowning in developing countries is a major, but often neglected, public health problem. However, due to a lack of reliable or statistical data concerning the impact of drowning in Iran, the need for drowning-prevention measures has not been recognized. The prevention of drowning requires adequate knowledge of its epidemiological characteristics and associated risk factors, and effective interventions.

**Aim:** The overall aim of this thesis is to analyze the magnitude and burden of drowning events, using both epidemiological and economic studies, and to evaluate the feasibility of a drowning intervention package in northern Iran.

**Material and methods:** The geographical range of the studies mainly encompassed water recreation areas near the Caspian Sea in northern Iran. The main focus of the studies was on describing factors associated with drowning among residents and tourists in northern Iran from 2005/6 through to 2008/9. Four studies were undertaken. The incidence of drowning fatalities in northern Iran was investigated in a cross-sectional household survey. Age group, gender, place and date of occurrence, and external causes were assessed (Paper I). A capture-recapture analysis was performed to estimate the incidence of drowning using two data registries (Paper II). The costs of drowning were assessed on the basis of case studies in northern Iran. The main cost elements were income, as adjusted by family and years, income impact on the family, and cost of treatment (Paper III). A quasi-experimental design was used to evaluate the feasibility of an intervention package, including pre- and post-observations, in both an intervention and a comparison community, in a water-recreation area by the Caspian Sea in northern Iran and in a residential population near the Caspian Sea coastline. Cross-sectional data were collected at pre-intervention and post-intervention in the study areas (Paper IV). Data for the four studies were derived from Iran’s Death Registry System and Forensic Medicine System, national weekly reports, household surveys, and focus group discussions.

**Results:** During the first year of investigation, 4.24 unintentional drowning deaths (4.24 per 100,000 resident population) occurred in the study area. More than one-third of all victims were under the age of 20, and the male-female risk ratio was 6.4:1 (Paper I). The capture-recapture method estimated that the Forensic Medicine System covered 54% of cases, and the Death Registry System 70% (Paper II). When additional information was considered, the estimated economic burden increased dramatically. In fact, the drowning cost of one drowned victim was equivalent to 17 times the country’s per-capita gross domestic product (Paper III). The risk of death from drowning was observed to be greater during the pre-intervention period than during the implementation period (OR = 1.15 versus 0.24) in a water-recreation area by the Caspian Sea in northern Iran. The fatal drowning rate in the studied resident population, in two provinces, fell from 4.24 per 100,000 residents at baseline to 3.04 per 100,000 residents at endline. Drowning rates for tourists could not be computed since denominator data were
The knowledge and practice of drowning prevention in the resident population increased from 22% at baseline to 35% at endline. Overall, the all-risk factors associated with drowning incidents declined to a greater extent in the intervention area than in the control area (Paper IV).

**Conclusions:** The intervention package, developed through research, was found to be feasible in the community considered. However, we need a longer time interval for impact analysis, and adjustment for seasonal variation, to be able fully to evaluate the effectiveness of the intervention. We also need to test the package in other, similar communities before we can recommend spread of the package. Further studies are needed to provide a standard instrument for drowning prevention.

**Keywords:** Drowning, prevention, cost, capture-recapture method, evaluation, Iran.